



# SCIENCE

By a group of supervisors

The Main Book

THEME

2

MATTER  
& ENERGY



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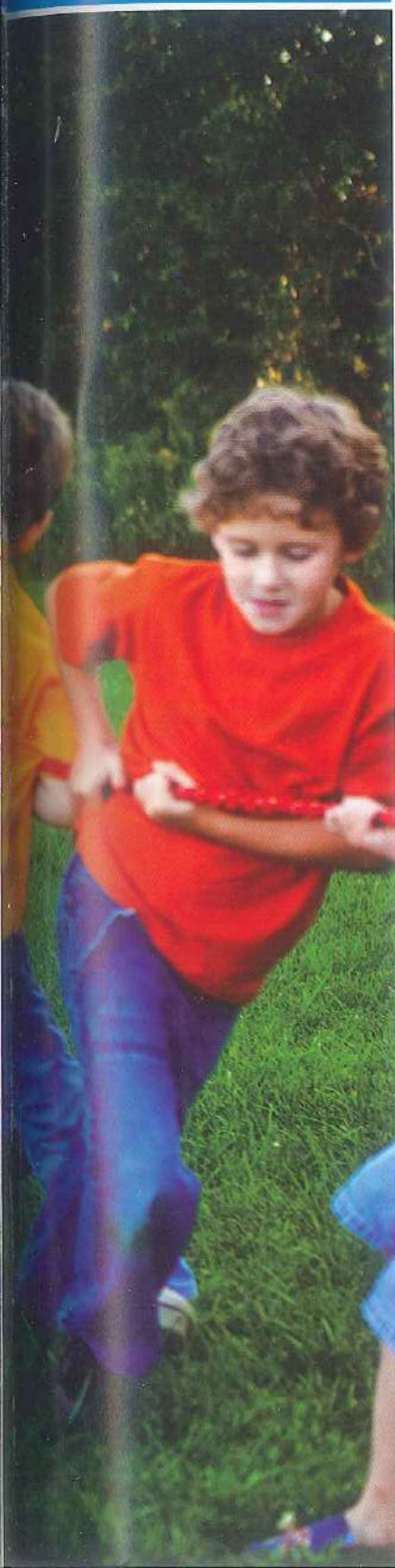
Concept

2.1

Starting and  
Stopping







## Learning outcomes

**By the end of this concept, your child will be able to :**

- Explain and model what causes objects to change motion.
- Analyze data to explain different causes of changes in an object's motion.
- Cite evidence to show how speed is related to energy for an object.
- Model the cause and effect relationship between the force acting on an object and the object's motion.

## Key vocabulary

- Energy
- Force
- Friction
- Gravity
- Motion
- Work



## Can You Explain?



► Did you think about how each of the previous objects start to move ?

- The previous objects require a **force** to stop or move. This force could be a pushing force or a pulling force.
- To move a stopped object, the forces acting on it need to change.
- Applying these forces to the objects requires **energy**, where :
  - The person in picture (1) needs energy to **push** the car.
  - The person in picture (2) needs energy to **pull** the suitcase.
  - The football player in picture (3) needs energy to **push** the ball, while the goalkeeper needs energy to **push** against the ball to stop it.

► In this concept, we will study :

- How forces act on different objects to move or stop them.
- The meaning of force.
- Using force to launch a satellite.
- The relationship between energy, work and force.

Notes for parents

- Discuss with your child some examples that need pushing force or pulling force.



## Activity 2

# Truck Versus Airplane

- Does the car move faster than the bicycle ?

Yes

No



- Does the truck move faster than the jet airplane ?

Yes

No



### Truck versus Jet airplane

The engines on a jet airplane are much more powerful than the engine in a truck. **So**, jet airplanes fly much faster than moving trucks.

#### ► What would happen if a jet engine is put on a normal truck ?

- The truck in the opposite figure is known as "the shockwave truck" which has been fitted with three jet engines.
- Due to these three jet engines, the shockwave truck can reach speeds of over 500 kilometers an hour, which means that it is about five times faster than the normal trucks that driving down the motorway.



The shockwave truck

- Help your child to read more about the shockwave truck from some online source and the meaning of the jet engine.



► **How does this truck move ? and how does it stop ?**

- The powerful engines help the shockwave truck start moving and reach record speeds.
- To solve the challenge of stopping this truck, the truck's engineers turned to the idea that is used in the rocket designs.
- They installed three parachutes that the driver opens to help slow down the truck quickly.



The shockwave truck with opened parachutes



**Check your understanding**

► **Complete the following sentences using the words below :**

**(faster than - slower than)**

1. The speed of a normal truck is ..... that of a jet airplane.
2. The speed of the shockwave truck is ..... that of a normal truck.

► **What happens if ... ?**

A jet engine is placed in a normal truck instead of its normal engine.

.....  
.....

**In the Exercises Book :**

**Try to answer :**

- Exercises on Lesson ① p. 5
- Self-Assessment ①

**Notes for parents**

- Let your child answer the questions to check his/her understanding.



# Making Things Move

► Look at the following pictures, then put (✓) or (✗) in front of the sentences below :



1. The ball will move, if the boy pushes it with his foot. ( )



2. The door will move, if the person doesn't pull it with his hand. ( )

► All objects around us cannot move without push and pull forces, where :

- A ball lying on the ground untouched, does not move until someone **pushes** it with his foot to make the ball roll.
- A closed door untouched, does not move until someone **pulls** the handle with his hand to open the door.

► Can air provide enough force to move an object ?

- Air or wind can move objects as the leaves of a tree move by the wind blowing.
- Some engineers make a simple activity to show that air can move objects, as they strap (fix) fire extinguishers onto a cart.
- When the engineers release air from the fire extinguishers, the air moves backward that makes the cart begins to move forward.



A cart with fire extinguishers

► By **increasing** the number of fire extinguishers, the **speed** of the cart **increases** and the **distance** that it moves **increases** too and vice versa.



## Check your understanding

► Put (✓) or (✗):

1. Push and pull forces cause objects to move. ( )
2. Air makes a force that can move some objects. ( )

• Discuss with your child that air provides force to move objects.



## Activity 4

# What Do You Already Know About Starting and Stopping ?

► How do objects move ?

There are two forces that cause objects to move which are :

Pushing force



A man **pushes** a wheelbarrow.

Pulling force



A child **pulls** a toy car.

One of the most important concepts to understand motion is to know the meaning of balanced forces and unbalanced forces.

### Balanced and unbalanced forces

In the two following pictures the children are playing tug-of-war, which show a rope being pulled in two opposite directions :



If the two teams are pulling the rope with **equal** forces, so the forces that act on the rope is **balanced** and the rope will **not** move.



If one team is pulling the rope with greater force, so the forces that act on the rope is **unbalanced** and the rope will **move** towards the team with the **greater** force.

### Notes for parents

- Discuss with your child the effect of balanced and unbalanced forces in our daily life.



► From the previous example, we can conclude that :

- If there are **balanced forces** act on an object, so this object **will not move**.
- If there are **unbalanced forces** act on an object, so this object **will move**.



### Check your understanding

► Put (✓) or (✗):

1. If an object moves, it means that the forces acting on it are balanced. ( )
2. The unbalanced forces cause objects to move. ( )

► Complete the sentence below each picture, using the words "pushing" or "pulling" :



1. The player uses the ..... force to hit the ball.



2. The man uses the ..... force to move his suitcase.



3. Children use the ..... force in tug-of-war game.



4. The boy uses the ..... force to move his skating board.

• Let your child answer the questions to check his/her understanding.



## Activity 5

# Objects in Motion

### ► How do we know an object is moving ?

- An object is in motion, if it is moving from one place to another.
- When we look at an object, we can describe its position compared to other things around it.

#### Motion :

It is any change in the position of an object relative to a fixed point.

### ► Example of an object motion :

- Imagine that you are holding a ball and standing next to a tree when you are playing "catch".
- The starting position of the ball movement is close to the tree.



When you throw the ball from your hand, it will **move** by the **pushing** force through the air.



Then the ball will **drop** into your friend's hand by the **pulling** force of gravity.

#### Gravity :

It is the force that pulls objects toward the center of Earth.



- The **pushing** force of your friend's hand against the ball will **stop** it.
- The position of the ball **changes**, relative to the tree.



#### **Note**

For any object to be in motion, there must be :

- A force (pushing force or pulling force).
- A change in the position of the object relative to a fixed point.

### Notes for parents

- Discuss with your child the meaning of gravity and its effect on all objects on Earth's surface.



• **Some motion is easy to see, such as :**

- A person walk down the street.
- A leaf blowing in the wind.
- A ball traveling through the air after it is thrown.



• **Some motion is hard to see, such as :**

The rotation of Earth around the Sun.



► **From the previous examples, we can observe that :**

- Any object is in motion if the position of the object **changes**, even if this change cannot be seen.
- The change in position of an object is compared to something else that is not usually moving (fixed).



### Check your understanding

► **Complete the following sentences using the words below :**

(pull - position - force - motion)

1. A ..... must act upon a ball to start motion, so the ..... of the ball must change.
2. There are two types of forces which are a push and a ..... that cause the ..... of any object.

**In the Exercises Book :**

Try to answer :

- Exercises on Lesson (2) p. 8
- Self-Assessment (2)

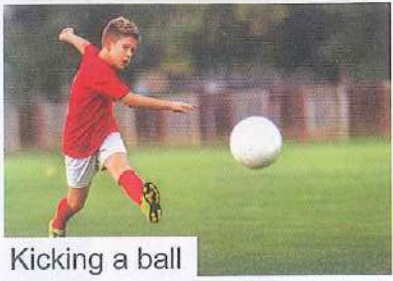
• Let your child answer the questions to check his/her understanding.



# Lesson 3

## Activity 6 Force

► Look at each picture, then write if the acting force is "Push" or "Pull" :



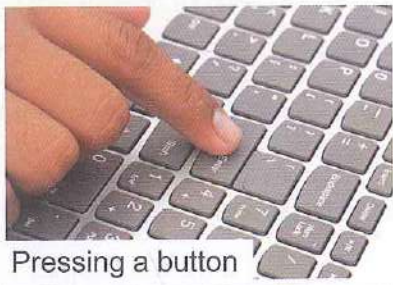
Kicking a ball

(.....)



Opening a drawer

(.....)



Pressing a button

(.....)



Lifting a bag

(.....)

### ► What makes objects move ?

- From the previous examples, we can observe that the world around us is in continuous motion, where somethings move quickly, while others move slowly.
- There are two types of force that make objects to be in motion which are pushing force and pulling force.

### Force :

It is a push or pull that is applied to an object causes it to change its position.

### ► Is there any force affects us when we are not in motion ?

- When you sit on a chair, you may not feel that there is any force acting on your body. In fact, **gravity** is **pulling** you downward and holding you in the chair.
- When you pull your bag up from the floor, there are multiple forces acting on the bag from different directions, where gravity pulls your bag down while your arm pulls it up.



### Notes for parents

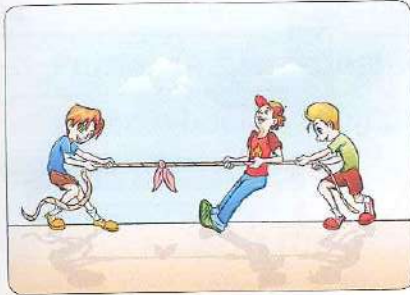
- Discuss with your child the meaning of force and its effect in our life.





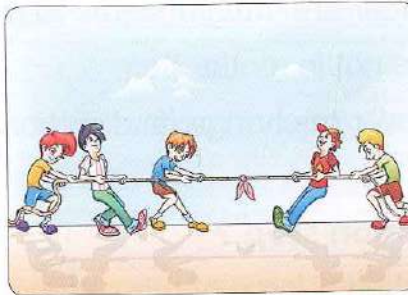
## Check your understanding

- Look at the following pictures, then complete the sentences below each picture by writing if the forces are **"balanced"** or **"unbalanced"** (If it is unbalanced draw an arrow that shows the direction of the rope motion) :



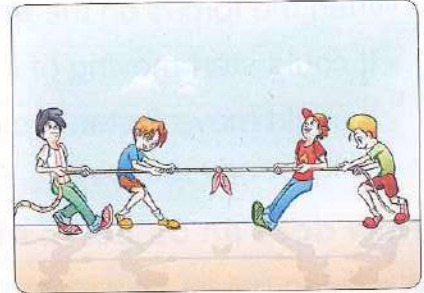
The forces in this figure are .....

Draw your arrow



The forces in this figure are .....

Draw your arrow



The forces in this figure are .....

Draw your arrow



## Optional Digital Activity

Activity (7) "Tug-of-War" in the school book is an optional digital activity. You can do this activity by scanning its QR code found in your school book.

• Let your child answer the question to check his/her understanding.

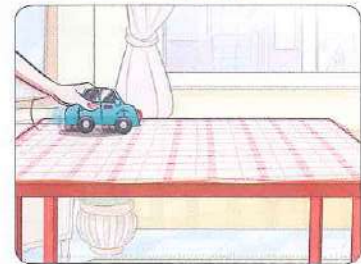
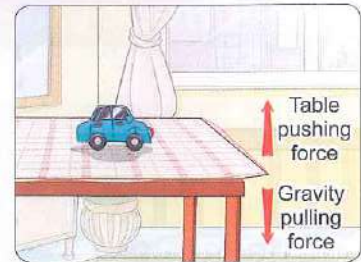


## Activity 8

# Stopping Motion

### ► In the opposite two pictures :

- The toy car on the table is being pulled down by gravity, and also pushed up by the force that the table exerts.
- When the forces on the toy car are **balanced**, it does not move.
- When the forces on the toy car are **unbalanced** :
  - It could start moving (if it is not in motion).
  - It could move faster or slower or change its direction (if it already moves).



### ► How does an object in motion stop ?

A moving object only stops when a force of the **same amount** is applied to it in the **opposite direction** of its motion.

- **Sometimes it is easy to observe where the force that stops an object comes from, such as :**

A car crashes into a wall, it will stop because the wall applied a force to the car with the same amount of the force that pushes the car towards the wall.

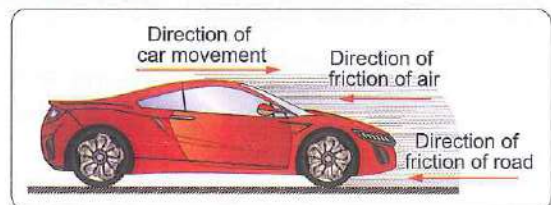


- **Sometimes it is hard to observe where the force that stops an object comes from, such as :**

A car runs out of fuel on a flat road, its speed decreases gradually until it stops.

Because there is a **friction** force comes from :

1. The friction (rub) between the car's tires and the road.
2. The friction between the air that flows over the car against its surface.



### Friction :

It is a force that is exerted when objects rub against each other.

#### Notes

- Friction force always slows down or stops motion of moving objects.
- The direction of friction force is always opposite to the direction of motion of a moving object.

### Notes for parents

- Discuss with your child the meaning of friction force.
- Let your child mention some other examples of friction force.





## Check your understanding

► Complete the following sentences using the words below :

(friction - balanced - opposes - unbalanced)

1. Any object moves from its place when the forces acting on it are .....
2. The force that slows down or stops motion is called .....
3. Friction is a force that ..... motion.
4. When a book is lying on a table without moving, the forces acting on it are .....

► Give a reason for :

When a car runs into a wall, it will stop.

.....  
.....

• Let your child answer the questions to check his/her understanding.



## Activity 9

# Launching a Satellite

Let's apply what we have learnt about force and motion to launching satellites into space.

### ► How forces are applied in launching a satellite into orbit in space :

- Every new satellite is carried into space by a rocket.

#### • Before launch :

The rocket stands motionless on its launch pad, it stays **still** because forces acting upon it are **balanced**.

#### • During launch :

The rocket is affected by **unbalanced** forces, so that it can **move away** from Earth.

Once the rocket is in space, it can release the satellite into orbit.

#### • In space :

The satellite can keep travelling at the same speed for hundreds of years because in space there is **no air**, so there is **no friction** force to slow down the satellite.



## Check your understanding

### ► Put (✓) or (✗) :

1. A satellite can keep travelling at the same speed for hundreds of years due to the presence of friction force in space. ( )
2. During launch a rocket, it can move away from Earth due to the balanced forces that act on it. ( )
3. The rocket stays still because the forces acting on it are unbalanced. ( )

### ► Give a reason for :

A satellite can keep travelling in space at the same speed for hundreds of years.

.....

### In the Exercises Book :

Try to answer :

- Exercises on Lesson ③ p. 12
- Self-Assessment ③

## Notes for parents

- Help your child to know more about launching rockets and how they are used to launch satellite in space.



Activity 10  
Rolling Cars

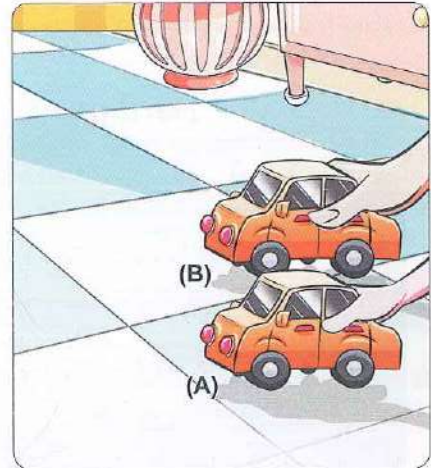
► Look at the opposite figure, then answer the question :

- If we roll the opposite two cars with two different forces, where car (A) will be pushed with a small force, while car (B) will be pushed with a greater force.
- Does car (B) travel a farther distance than car (A) ?

Yes

No

- You have learnt about the causes of motion, in this activity you will explore the effect of applying different amounts of force to an object.
- You will investigate this by rolling toy cars across the floor.



► Tools



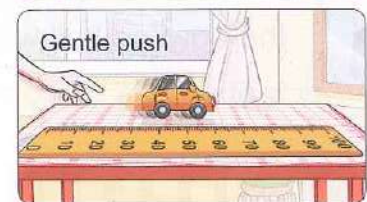
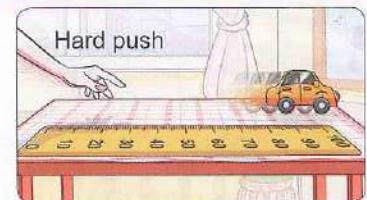
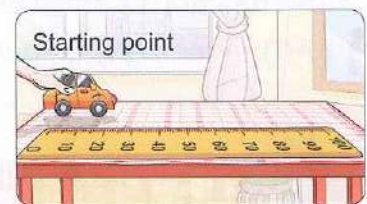
Toy car



Measuring ruler

► Steps

1. Push a toy car hard from a starting point.
2. Record the distance the toy car rolls by using the measuring tape.
3. Repeat step (1) and (2) several times, and record the data in a table, then find the average distance.
4. Push a toy car very gently from the same starting point.
5. Record the distance the toy car rolls.
6. Repeat step (4) and (5) several times, and record the data in another table, then find the average distance.



• Discuss with your child the relation between the amount of force that acts on an object and the distance covered by this object.



## Observations

- The car moves a **large** distance when it is pushed **hard** as shown in the following table :

Hard push	
Trial	Distance (cm)
1	90 cm
2	75 cm
3	80 cm
4	95 cm
The average distance = $\frac{90 + 75 + 80 + 95}{4} = 85 \text{ cm}$	

- The car moves a **small** distance when it is pushed **gently** as shown in the following table :

Gentle push	
Trial	Distance (cm)
1	14 cm
2	17 cm
3	20 cm
4	17 cm
The average distance = $\frac{14 + 17 + 20 + 17}{4} = 17 \text{ cm}$	

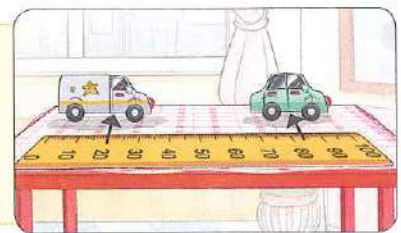
## Conclusions

- Hard push causes object to travel a long distance.
- Gentle push causes object to travel a small distance.

### Note

If the **same force** acts on a toy car and a toy truck :

- The car (the small object) will travel a farther distance.
- The truck (the bigger object) will travel a shorter distance.



## Check your understanding

Put (✓) or (✗) :

- A toy car travels a very small distance when it is pushed hard. ( )
- When we threw a bowling ball and a tennis ball with the same force, the bowling ball will move faster. ( )

### In the Exercises Book :

Try to answer :

- Exercises on Lesson (4) p. 16
- Self-Assessment (4)

## Notes for parents

- Let your child answer the questions to check his/her understanding.



# Lesson 5

## Activity 11

# Energy, Work and Force

► Look at the following pictures, then answer the questions :

- The car moves when a pushing force acts on it.

Yes

No



- The ball stops when a pushing force acts against it.

Yes

No



### The relationship between energy, work and force

- To make an object start or stop moving, this requires **a force** (either a push or a pull).
  - Applying this force to the object requires **energy**.
- The following example shows the relationship between energy, work and force :
- Imagine you had to push a car along a flat road, moving the car needs a lot of force.
  - When you push the car, the energy transfers from your body to the car due to the force that your body exerts on the car.
  - When you move the car, you are doing **work**.
- From the previous example, we can conclude that :
- Force transfers energy from one object to another.
  - **Force** is the effect that changes **energy** in such a way that it makes this energy has the ability to do **work**.
  - So, the work done is equal to the amount of energy transferred by a force that is used to move an object.



- Discuss with your child the relation between energy, work and force.





### Note

Force and energy are different, but they are related to one another, where force is the effect that changes energy and turns it into work.



### Check your understanding

► Complete the following sentences using the words below :

(energy - equal to - force - work)

1. To make an object start or stop moving, this requires .....
2. When a man applies a pushing force on a cart, ..... transfers from his body to the cart.
3. When you push a car, you are doing .....
4. The amount of energy transferred by a force that is used to move a car from its position is ..... the work done to move the car.

#### In the Exercises Book :

Try to answer :

- Exercises on Lesson (5) p. 19
- Self-Assessment (5)
- Model Exam on Concept ( 2.1)

### Notes for parents

- Let your child answer the questions to check his/her understanding.



## Activity 12

# Record Evidence Like A Scientist

- ▶ In this concept, you have learnt a lot about the role of balanced and unbalanced forces in starting and stopping motion.
- **Now**, try to think like a scientist by writing your hypothesis (claim), your evidence and your scientific explanation about one of the main points of this concept through the four steps you have learnt in the previous concepts.

### Step 1 The Question

How do forces act on different objects to make them start moving and stop moving ?

### Step 2 My Hypothesis (Claim)

.....

.....

.....

### Step 3 My Evidence

.....

.....

.....

.....

### Step 4 My Scientific Explanation

.....

.....

.....

.....

.....

- Help your child to think like a scientist by answering a question about one of the main points of this concept, then write his/her hypothesis, evidence and scientific explanation.



## Activity 13

# Review : Starting and Stopping

► We can summarize this concept in the following main points :

- The shockwave truck has been fitted with three jet engines, so that it is about five times faster than the normal truck.
- To solve the challenge of stopping the shockwave truck, the truck's engineers installed three parachutes that the driver opens to help slow down the truck quickly.

• There are two forces that cause objects to move which are :

- Pushing force.
- Pulling force.
- Air or wind can move objects as the leaves on a tree move by the wind blowing.
- When some engineers fix fire extinguishers onto a cart, then release air from the fire extinguishers, the air makes the cart begins to move forward.

- If **balanced forces** act on an object, it will **not move**.
- If **unbalanced forces** act on an object, it will move towards the **greater force**.

### Motion :

It is any change in the position of an object relative to a fixed point.

### Gravity :

It is the force that pulls objects toward the center of Earth.

- Some motion is easy to see such as, a person walk down the street.
- Some motion is hard to see such as, the rotation of Earth around the Sun.

### Force :

It is a push or pull that is applied to an object causes it to change its position.

- Moving object only stops when a force of the **same amount** is applied to it in the **opposite direction** of its motion.

### Friction :

It is a force that is exerted when objects rub against each other.

- Friction force always slows down or stops motion of moving objects.
- The direction of friction force is always opposite to the direction of motion of a moving object.

### Notes for parents

- Help your child review the main points in this concept.



- **Before launch** a rocket, it stays still because the forces acting on it are **balanced**.
  - **During launch** a rocket, it can move away from Earth due to the **unbalanced** forces that act on it.
  - **In space**, a satellite can keep travelling at the **same speed** for hundreds of years because in space there is no air, so there is **no friction** force to slow down the satellite.
- 

- **Hard push** causes object to travel **a long distance**.
- **Gentle push** causes object to travel **a small distance**.
- Force transfers energy from one object to another.
- **Force** is the effect that changes **energy** in such a way that it makes this energy has the ability to do **work**.
- So, the work done is equal to the amount of energy transferred by a force that is used to move an object.



Concept

2.2

# Energy and Motion







## Learning outcomes

**By the end of this concept, your child will be able to :**

- Investigate the forms of energy in a system or for an object.
- Apply logical reasoning to predict the types of energy for an object.
- Cite evidence to explain how energy is conserved.

## Key vocabulary

- Kinetic energy.
- Potential energy.
- Chemical energy.
- Gravitational potential energy.
- Thermal energy.



## Activity 1

## Can You Explain?



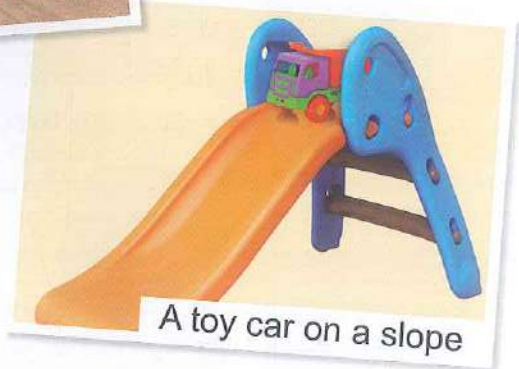
Skiing on a sand hill

Figure (1)



A player kicks a ball

Figure (2)



A toy car on a slope

Figure (3)

► In the previous concept, you have learnt that :

Objects need a force to move or stop and this force on objects needs energy to be able to do work, so how do moving objects get energy ?

- In figure (1), A sand surfer moves very fast down the sand hill.
- In figure (2), The ball moves through the air when the player kicks it with his foot.
- In figure (3), The toy car on a slope will not move at all if no force is applied on it.

► From the previous explanation, we can conclude that :

- All moving objects have a type of energy known as **kinetic energy**.
- Some objects that do not move don't have kinetic energy but they have another type of energy known as **potential energy** that is stored inside them, when these objects start to move, they get kinetic energy.

► In this concept, we will study :

- The meaning of energy and its basics.
- Types of energy.
- Kinetic energy and potential energy.
- Energy transformation in engines.

**Notes for parents**

- Let your child mention some other examples of objects that have kinetic energy and potential energy.



## Activity 2

# Roller Coasters

► From the previous activity, you have learnt that :

All moving objects have a type of energy known as **kinetic energy**.

- In your opinion, which of the following energies are responsible for the movement of the roller coaster (train) ?

- a. **Kinetic** energy and **light** energy.
- b. **Potential** energy and **sound** energy.
- c. **Electric** energy and **kinetic** energy.
- d. **Sound** energy and **heat** energy.



Roller coaster

**How does the roller coaster move and what is the source of its kinetic energy ?**

The roller coaster moves up rapidly, then its speed decreases gradually until it reaches the highest point, then it pauses briefly at the top of the hill (ramp), then the speed of the train will increase as it moves down the hill.

• To know the source of energy that makes the train move with this speed, read the following steps :

1. At the beginning of the roller coaster, there are electric motors that work by electricity, these motors are used to carry the train cars up to the top of the hill.



2. When the roller coaster reaches the highest point of the hill, the cars of the train actually store some energy during their rising to the top of the hill.



3. As the roller coaster moves down the hill, the energy stored in the train changes into a more active form of energy which is kinetic energy that helps it moves downward, so the train doesn't need electricity. While the roller coaster races down the hill, the kinetic energy increases as its speed increases.



• Discuss with your child the different types of energy in the roller coaster during its movement.



► From the previous explanation, we can conclude that :

- When the roller coaster moves downward, its kinetic energy increases.
- The **kinetic energy increases** as the **speed increases**.

### ? **What happens if ... ?**

- **A roller coaster moves from up to down. (according to its energy).**  
The stored energy in the train is changed into kinetic energy.
- **A roller coaster stops. (according to its energy).**  
Its kinetic energy becomes zero.



### **Check your understanding**

► **Put (✓) or (✗) :**

1. Kinetic energy of a moving object increases as the speed increases. ( )
2. When a roller coaster moves from up to down, it has the most kinetic energy when it reaches the lowest point of the hill. ( )
3. When the roller coaster moves downward, its kinetic energy decreases. ( )

### **Notes for parents**

- Let your child answer the questions to check his/her understanding.

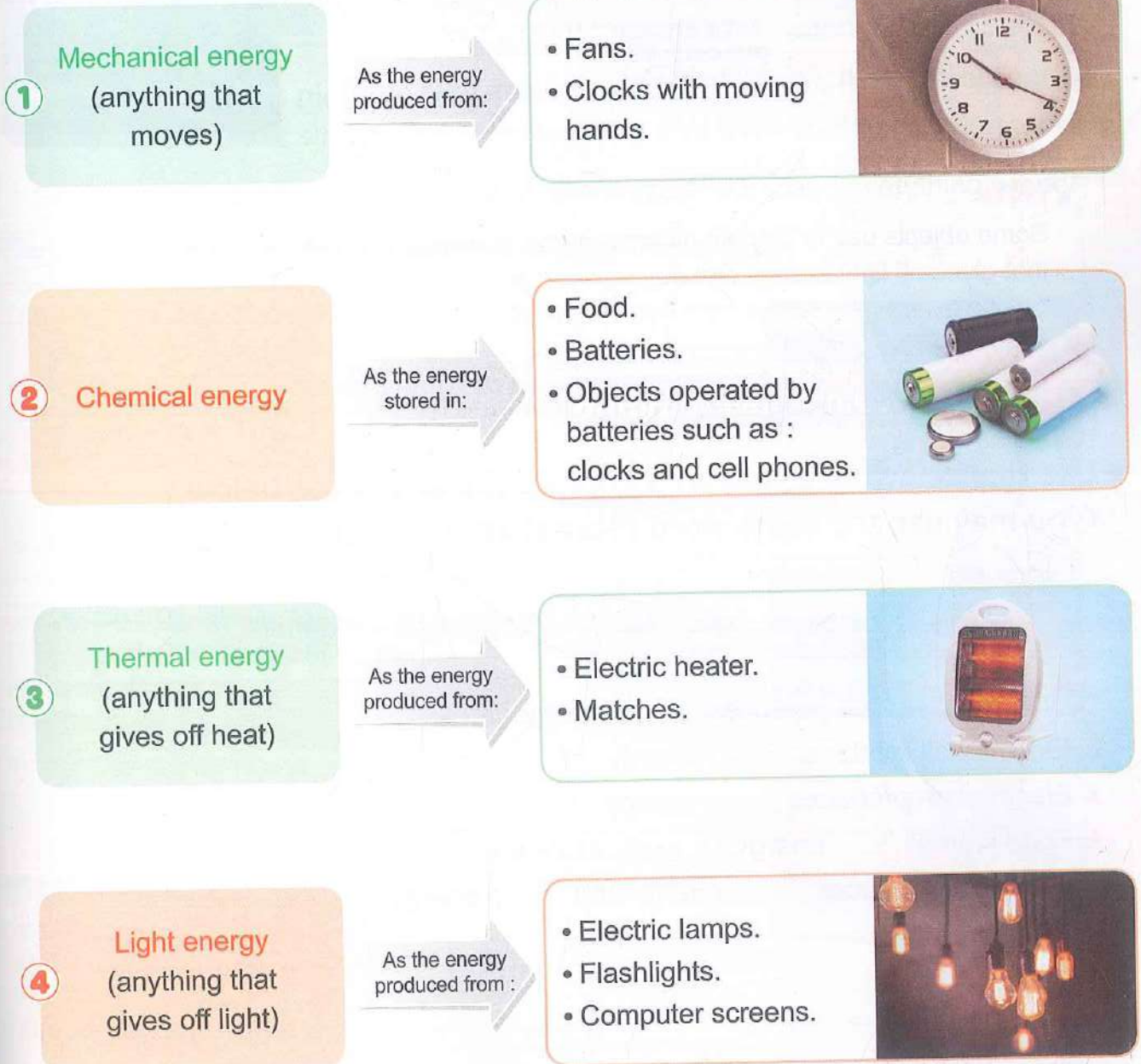


## Activity 3

# Energy in the Classroom

- ▶ Energy is very important in our life. Most things around us use or contain energy.
- ▶ Energy is found everywhere as in the classroom, laboratory, home, ... etc.
- **Now**, we will study different forms of energy.

### Forms of energy



• Discuss with your child the different forms of energy and let him/her mention some other examples of each of them.



5

**Electrical energy**  
(anything works  
by electricity)

As the energy  
used to operate:

- Computers.
- Overhead projectors.
- Televisions.



6

**Sound energy**  
(anything that  
produces sound)

As the energy  
produced from:

- Musical instruments.
- Radios.
- Alarm bells.



### Note

Some objects use or contain different forms of energy such as the electric lamp that gives off light energy and thermal energy.



## Check your understanding

► Use the following words to complete the sentences below :  
(you may use the same word more than one time)

(chemical – light – sound – mechanical – thermal)

1. Washing machine produces ..... energy.
2. Electric bell produces ..... energy.
3. Electric iron produces ..... energy.
4. Food stores ..... energy.
5. Television produces ..... energy and ..... energy.

### In the Exercises Book :

Try to answer :

- Exercises on Lesson ① p. 20
- Self-Assessment ⑥

### Notes for parents

- Let your child answer the questions to check his/her understanding.



# What Do You Already Know About Energy and Motion ?

► Observe these pictures, then put (✓) in front of the objects that have energy.



► From the previous pictures, you can observe that we need energy to do all our daily activities such as running, walking and even during reading a book.

So, energy is part of everything that happens in the world and everything we do.

Examples show the importance of energy in our life :

1

We eat food to obtain energy to help us grow and move.



2

Energy affects objects and makes them move and change their places.



3

Energy helps in operating all electric devices.



4

Energy helps in cooking.



• Discuss with your child the importance of different forms of energy in our daily life.



## Moving Energy

- Energy moves (transfers) from an object to another as in the example below that shows a player kicks a ball as shown in the following steps :

1 The kinetic energy transfers from the player's foot to the ball when he kicks it.



2 Then, the ball moves in the air as a result of the transfer of kinetic energy to it.



3 Then, the kinetic energy transfers from the ball to the goal net which vibrates as a result of the transfer of kinetic energy to it.



### Note

Any stopped object on the Earth's surface as in figure (1) has no energy, while any stopped object at a height from the Earth's surface as in figure (2) has a special type of energy known as **potential energy**.



Figure (1)



Figure (2)



## Check your understanding

► Put (✓) or (✗) :

1. A bar of chocolate has no energy. ( )
2. Energy affects objects and makes them move and change their places. ( )
3. Energy doesn't transfer from an object to another. ( )

## Notes for parents

- Discuss with your child how energy can be transferred from one object to another.



## Activity 5

# Energy Basics

► From the previous concept, you have learnt that there is a relation between energy, force and work, where :

- Force is something that changes energy to make it able to do work.
- **Now**, in this concept we can define energy and work.

### Energy:

It is the ability to do work or cause change.

### Work:

It is a force that causes an object to move a distance.

**Example shows the relation between energy and work :**

- When a football player kicks a ball, the force of his kick causes the ball move in a different direction.
- Thus the player does work and he consumes energy (that he had obtained from food) to move his leg.
- So, the work done by this player causes the ball to move.



### Facts about energy

- 1 Energy can be stored and changed from one form into another form.

#### Example :

When you hold a book, it stores a **potential energy**, when you let it falls down to the ground, the book is moving where the **potential energy changes into kinetic energy**.



- 2 Most forms of energy can't be seen.

#### Example :

Sound energy, thermal energy, electrical energy and chemical energy are forms of energy that can't be seen.



• Discuss with your child the meaning of energy and work.



3

**We can see and measure what energy can do.**

**Example :**

When you push a wooden box and this box moves, this means that the energy transfers from you to the box.



**Check your understanding**

► **Complete the following sentences :**

1. The ability to do work is known as .....
2. The force that causes an object to move a distance is known as .....

► **Put (✓) or (✗) :**

1. Energy doesn't change from one form into another form. ( )
2. When you push a wall and this wall doesn't move, this means that you does work. ( )
3. The person who pushes a car forward and this car moves, this means that the person consumes energy. ( )

**Notes for parents**

- Let your child answer the questions to check his/her understanding.



## Activity 6

# Kinetic and Potential Energy

► Scientists classify energy into two types which are :

1. Potential energy.

2. Kinetic energy.

- Objects have kinetic energy if they are in motion, but they have potential energy if they are stopped at a height from the Earth's surface.

### 1 Potential energy :

#### Potential energy :

It is the amount of energy that is stored in an object due to its position.

#### Example :

The ball has a potential energy stored in it when you lift it up away from the Earth's surface.



### 2 Kinetic energy :

#### Kinetic energy :

It is the energy of an object due to its motion.

#### Example :

The ball has a kinetic energy when you let it falls down to the ground.



### Notes

- If there were no energy on Earth, nothing would get done.
- When an object has a potential energy, this means that this object is ready to do work or to be active.

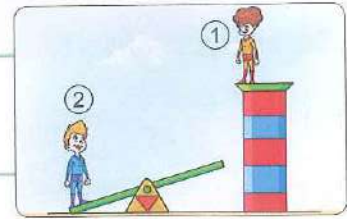
• **Now**, let's see an example to find out how the potential energy can be changed into kinetic energy.

• Help your child to understand the meaning of potential energy and kinetic energy through some other examples.

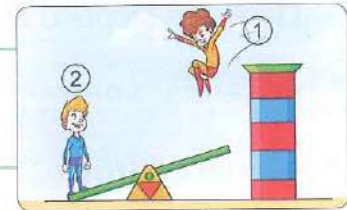


## Example shows converting the potential energy into kinetic energy

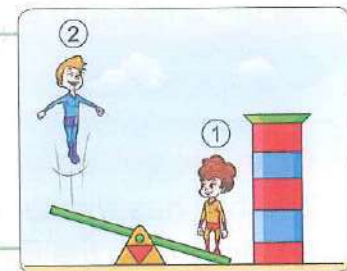
1 Acrobat ① on the tower has a potential energy.



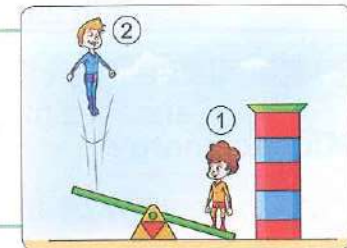
2 When he jumped down, his potential energy is converted into kinetic energy.



3 The resulted kinetic energy transfers to the acrobat ② who standing on the seesaw at the base of the tower and causes him to be pushed up into the air.



4 During the movement of acrobat ② up in the air, its kinetic energy is converted gradually into potential energy.



### Note

As the height of an object from the Earth's surface increases, its potential energy that is stored inside it increases.



## Check your understanding

### ► Complete the following sentences :

1. Scientists classify energy into two types which are ..... energy and ..... energy.
2. The object has a ..... energy stored in it when you lift it up away from the Earth's surface.
3. Potential energy ..... by increasing the height of the object from the Earth's surface.

### In the Exercises Book :

Try to answer :

- Exercises on Lesson ② p. 25
- Self-Assessment ⑦

### Notes for parents

- Let your child answer the questions to check his/her understanding.



# Lesson 3

## Activity 7

# Forms of Potential and Kinetic Energy

► Complete the sentences below each picture by writing **potential** or **kinetic**.



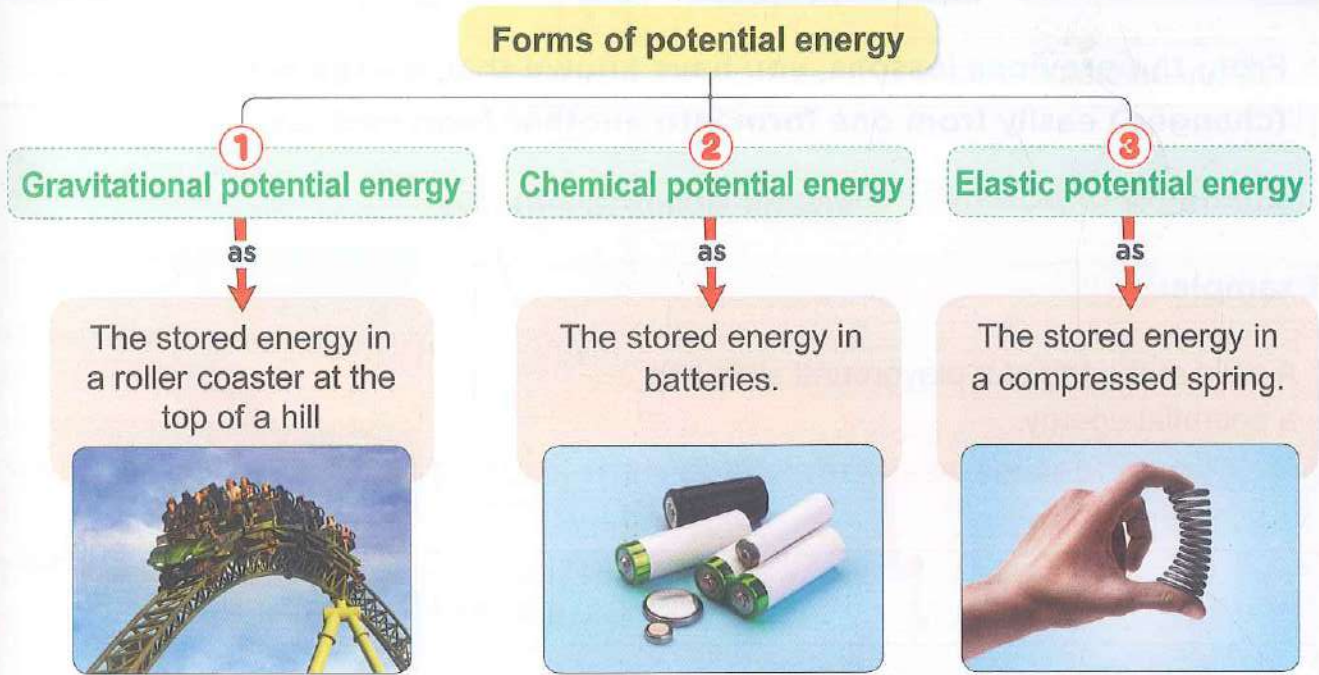
1- The ball has ..... energy.



2- The bike has ..... energy.

### Forms of potential energy

- Potential energy is the stored energy in an object due to its position.
- We can say that an object with potential energy is not doing anything right now, but it has stored energy enables it does work in the future.



### ⚡ Note

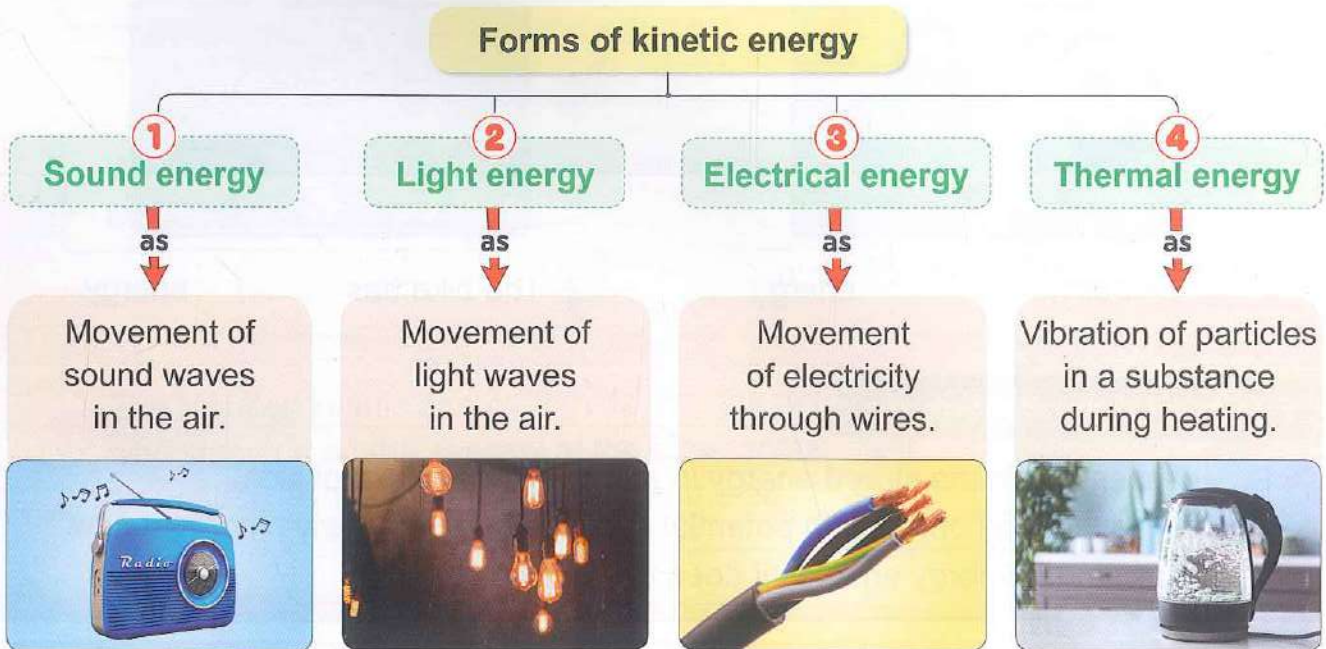
The chemical energy in the battery is not used until this battery is connected to a device.

- Help your child to know that all forms of energy are classified into two main groups which are the potential energy and the kinetic energy.



## Forms of kinetic energy

- Kinetic energy is the energy of an object due to its motion.
- Any moving object has a kinetic energy.



- From the previous lessons, you have known that energy is transformed (changed) easily from one form into another form such as :

### Changing of potential energy into kinetic energy.

#### Example:

A child at the top of a playground slide has a potential energy.



A child has potential energy

When the child moves down along the slide, the potential energy changes into kinetic energy.



A child has kinetic energy

#### Notes for parents

- Let your child mention some other examples of changing the potential energy into kinetic energy.





### Note

Potential energy of any object depends on :

1. How large the object is (the **mass** of the object in kilogram).
2. How high up the object is from the Earth's surface (the **height** from the Earth's surface).

#### ► Gravitational potential energy :

is the form of the stored potential energy in the roller coaster when it **moves up** on the hill.

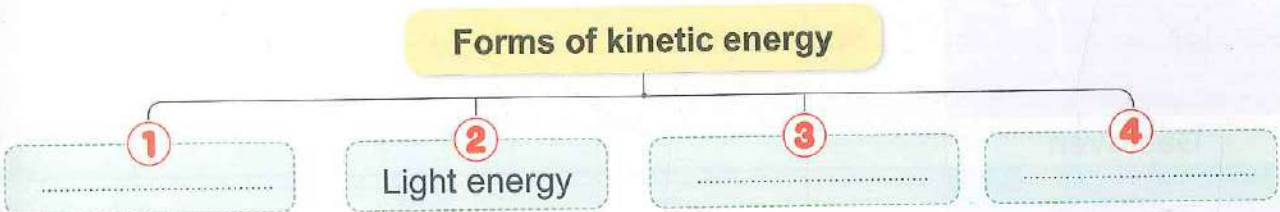
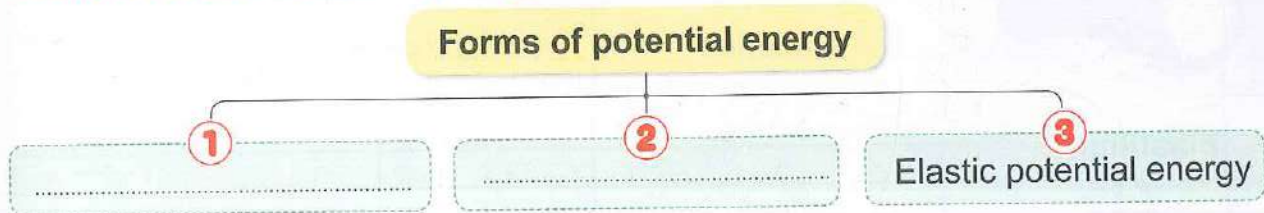
#### ► Kinetic energy :

is the form of energy that the potential energy of the roller coaster is converted into when it **goes down** the hill.



### Check your understanding

#### ► Complete the following diagrams :



#### ► Look at the opposite picture, then complete these sentences by using these words :

gravitational potential – kinetic – energy

1. The force that pulls the egg to the ground is the ..... energy.
2. The egg has a ..... energy as it falls down.
3. The egg got ..... to fall from the hand that is picking it up and holding it.



• Help your child to know that potential energy depends on the mass of an object and its height from the Earth's surface.







## Activity 8

# Types of Energy

- Energy is found everywhere around us.
- Energy is continuously changing and transforming from one form into another form.
- Energy is transferred from one place to another (such as when you kick a ball, energy moves from your leg to the ball).
- All forms of energy are classified into either potential energy or kinetic energy.
- Potential energy can easily change into kinetic energy and vice versa.

### Some changes of potential energy into kinetic energy

Example	Source of energy	Energy changes	
		From	Into
 <b>Flashlight</b>	Batteries	Chemical energy	Light energy and thermal energy.
 <b>Gas oven</b>	Natural gas	Chemical energy	Thermal energy.
 <b>Spring-powered car</b>	Spring wire	Potential energy	Kinetic energy.
 <b>Real car</b>	Gasoline	Chemical energy	Mechanical kinetic energy, sound energy and thermal energy.

### Notes for parents

- Let your child mention some other changes of energy in our daily life.



► From the previous explanation, we can conclude that :

- Energy can be stored in many different forms.
- New energy cannot be created and also existing energy cannot be destroyed.

 **Note**

The food you eat also stores chemical energy, where your digestive system breaks down the food you eat and changes it into energy stored in your body.



**Check your understanding**

► Complete the following table :

Example	Energy changes	
	From	Into
1. Electric fan	.....	.....
2. Door bell	.....	.....
3. Radio	.....	.....
4. Electric lamp	.....	.....
5. Cellular phone	.....	.....



**Optional Digital Activity**

Activity (9) "Forms of Energy", in the school book is an optional digital activity. You can do this activity by scanning its QR code found in your school book.

**In the Exercises Book :**

Try to answer :

- Exercises on Lesson (3) p. 30
- Self-Assessment (8)

• Let your child answer the questions to check his/her understanding.



# Lesson 4

## Activity 10

# Energy Transformation in Engines

► Look at these pictures , then put (✓) or (✗) :



1. The form of energy that is stored in the food is the chemical energy. ( )
2. Fuel (gasoline) inside the car is similar to the food inside the body of the living organism. ( )

- Food we eat gives us energy to do activities as cars, trucks, boats and many other vehicles need gasoline to move.

### Energy transformation in engines

- Gasoline is one of the **petroleum** components.
- Gasoline contains **chemical potential energy**, where the car's engine transforms this energy to power the car.
- In this diagram, we will summarize the energy transformation in engines :



**The chemical potential energy stored in gasoline**  
is changed inside the car's engine into

Mechanical kinetic energy

Sound energy

Thermal energy

It is produced to power (move) the car.

They are produced when the car's engine runs.

### Notes for parents

- Discuss with your child the changes of energy that take place inside the car's engine.



## How does the engine work to move the car ?

- The opposite image shows the engine inside a car which is called **an internal combustion engine**.
- The internal combustion engine helps in the safely burn of the gasoline inside the engine.
- When the gasoline is burned, its **chemical potential energy** changes into **kinetic energy** that causes the car to move.



### ► From the previous explanation, we can conclude that :

- Energy cannot be created or destroyed, but it changes from one form into another.
- Fuel (gasoline) inside the car is similar to the food inside the body of the living organism, *because burning of each of them produces kinetic energy that enables the car to move and the living organism to carry out different activities.*



## Check your understanding

### ► Complete the following sentences :

1. The internal combustion engine changes the ..... energy into ..... energy.
2. The ..... energy stored in food changes into ..... energy that people use to move.
3. Gasoline contains ..... energy.
4. On operating a car engine, some of chemical potential energy stored in the fuel changes into ..... energy and ..... energy.

• Let your child answer the questions to check his/her understanding.



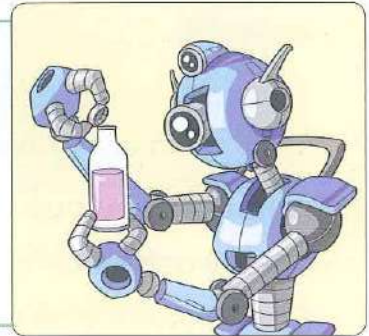
## Activity 11

# Easy Life Tool

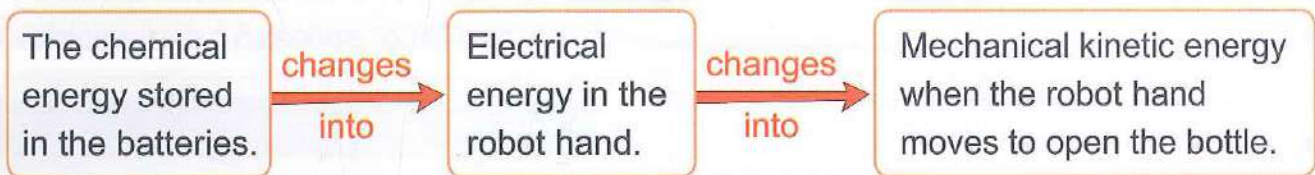
- You have learnt a lot about different forms of energy and how they can transform from one form into another.
- **Now**, you can use this knowledge to design a **simple tool** that helps us to do work.

### Example :

- **My tool** : A robot
- **Its function** : Opening the bottle cap that it is hard to open.
- **The source of energy** : The robot gets power from batteries when it is turned on.



### The changes of forms of energy inside the robot



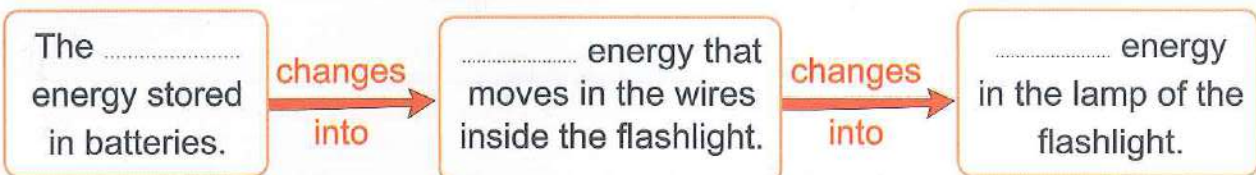
### ► From the previous explanation, we can conclude that :

- Energy is not created or lost (destroyed) when transferred from the battery to the hand of the robot.
- Energy is converted from one form (chemical energy) to another form of energy (mechanical energy) when the robot uses its hand to open the bottle.



### Check your understanding

### ► Complete the following diagram that shows the changes of energy when you switch on a flashlight :



#### In the Exercises Book :

Try to answer :

- Exercises on Lesson (4) p. 35
- Self-Assessment (9)

### Notes for parents

- Help your child to understand the concept of that energy is not created or destroyed.



# Record Evidence like A Scientist

- ▶ In this concept, you have learnt about energy, motion, forms of potential energy and kinetic energy, and energy transformation in engines.
- **Now**, try to think like a scientist by writing your hypothesis (claim), your evidence and your scientific explanation about one of the main points of this concept through the four steps you have learnt in the previous concepts.

 **Step 1 The Question**

How do moving objects get energy and what are the changes of energy that take place inside them?

 **Step 2 My Hypothesis (Claim)**

.....

.....

.....

 **Step 3 My Evidence**

.....

.....

.....

.....

 **Step 4 My Scientific Explanation**

.....

.....

.....

.....

.....

• Help your child to think like a scientist by answering a question about one of the main points of this concept, then write his/her hypothesis, evidence and scientific explanation.



## Activity 13

# STEM in Action

### Kinetic energy and potential energy in winter sports.

- Figure skating (or ice skating) is a popular winter sport in many countries.
- There are many transformations of energy that occur during ice skating.



### Transformations of potential and kinetic energies during ice skating.

- ▶ Look at the following picture, then read the information below to know the transformations of potential energy and kinetic energy during ice skating.



- 1 When a skater begins to skate, the **potential energy** stored in the skater's body changes into **kinetic energy**.



- 2 This **kinetic energy** and his strong leg muscles help him jump high into the air.



- 3 At the top of the jump, his energy changes again, because when he is up in the air, he has the **most potential energy**.



- 4 When he reaches the highest point in the air, the gravity pulls him back down to the ice, so the stored **potential energy** in his body changes into **kinetic energy** again.

### Notes for parents

- Help your child to analyze the movement of the ice-skater to understand the changes of energy during his skating.



► From the previous explanation, we can conclude that :

- At the beginning of skating, the skater has the **least kinetic energy**.
- The skater has the **most kinetic energy** when he starts jumping and flipping in the air.

 **Notes**

- Ice-skaters not only learn the skills of skating and jumping, but they also learn how to be strong and confident. They discover what foods to eat to provide energy for skating and life.
- The amount of potential energy differs from the amount of kinetic energy according to each sporting activity you do.



**Check your understanding**

► Look at these pictures, then write the letter **P** in front of the picture that has "most potential energy" and the letter **K** in front of the picture that has the "most kinetic energy".



**In the Exercises Book :**

Try to answer :

- Exercises on Lesson (5) p. 38
- Self-Assessment (10)
- Model Exam on Concept ( 2.2)

• Let your child answer the question to check his/her understanding.



## Activity 14

# Review : Energy and Motion

► We can summarize this concept in the following main points :

- Energy is very important in our life and it is found everywhere around us.
- All moving objects have kinetic energy.
- The roller coaster has a potential energy stores in it when it reaches the highest point of the hill, this energy changes into kinetic energy when the roller coaster races down the hill.
- The kinetic energy increases as the speed increases.

### Forms of energy

- Mechanical energy.
- Chemical energy.
- Thermal energy.
- Light energy.
- Electrical energy.
- Sound energy.

### Energy :

It is the ability to do work or to cause change .

### Work :

It is a force that causes an object to move a distance.

### Potential energy :

It is the amount of energy that is stored in an object due to its position.

### Kinetic energy :

It is the energy of an object due to its motion.

- Energy can be stored and changed from one form to another.
- Potential energy changes into kinetic energy and vice versa.

### Forms of potential energy

- Gravitational potential energy.
- Chemical potential energy.
- Elastic potential energy.

### Forms of kinetic energy

- Sound energy.
- Light energy.
- Electrical energy.
- Thermal energy.

### Notes for parents

- Help your child to review the main points in this concept.



- As the height of an object from the Earth's surface increases, its potential energy that is stored inside it increases.

• **Potential energy of any object depends on :**

1. How large the object is (the **mass** of object in kilogram).
2. How high up the object is from the Earth's surface ( the **height** of the object from the Earth's surface).

► **Some changes of potential energy into kinetic energy :**

Example	Energy changes	
	From	Into
• Flashlight.	Chemical energy.	Light energy and thermal energy.
• Gas oven.	Chemical energy.	Thermal energy.
• Spring-powered car.	Potential energy.	Kinetic energy.
• Real car.	Chemical energy.	Kinetic energy, sound energy and thermal energy.

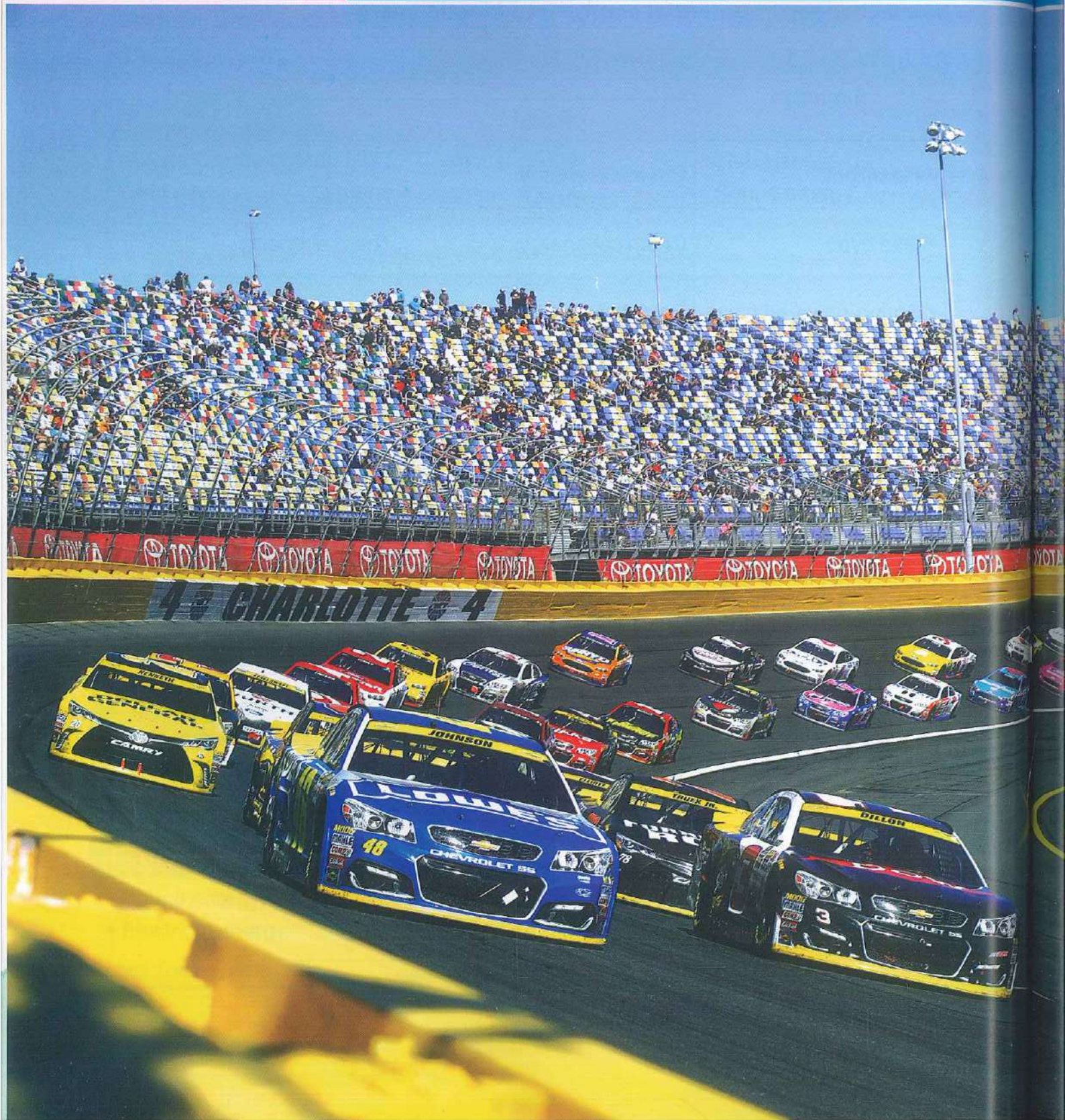
- The chemical energy stored in food changes into kinetic energy that helps us to do activities.
- In car's engine, the chemical potential energy stored in gasoline changes into mechanical kinetic energy to move the car.
- Energy cannot be created or destroyed, but it changes from one form into another.
- At the beginning of the skating, the skater has the least kinetic energy.
- The skater has the most kinetic energy, when starts jumping and flipping in the air.



Concept

2.3

Speed







## Learning outcomes

**By the end of this concept, your child will be able to :**

- Calculate the speed of objects using standard units of measurement.
- Describe how an object's change in position occurs at different rates.
- Model data to show patterns in the speed of objects and use these patterns to predict future motion.
- Cite evidence to explain how speed is related to the amount of kinetic energy of an object.
- Explain why an object's speed can change.

## Key vocabulary

- Resistance
- Speed



# Can You Explain?



Runner



Rocket



Horse



High-speed train

### ► How can we measure the speed of something moving fast ?

To measure the speed of an object, we need to know :

#### 1 Distance :

- It is the distance that the object traveled.
- It is measured in **kilometers** or **meters**.

#### 2 Time :

- It is the time taken by the object to travel that distance.
- It is measured in **hours** or **seconds**.

So, we can measure the **speed** of the objects in the previous pictures in **kilometers per hour** or **meters per second**.

### ► In this concept, we will study :

- Cheetah speed.
- Objects move at different speeds.
- Basics of speed.
- Measuring an object's motion.
- Calculating speed.
- Changing speed.
- Solar vehicles.

### Notes for parents

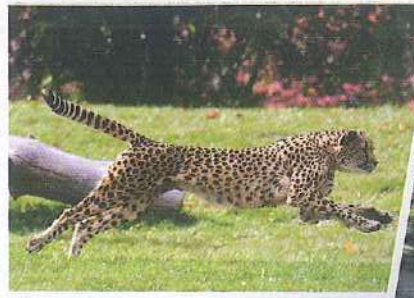
- Discuss with your child the different measuring units of each of distance, time and speed.



## Activity 2

# Cheetah Speed

► Look at the following pictures, then answer the questions :



• Does cheetah run faster than a human ?

Yes

No

• Does cheetah run faster than a car ?

Yes

No

- We know that cars, trains and other vehicles can move very fast, but what about animals ?

- You may have heard that a cheetah (one of the cat species) is the fastest land animal on the Earth.

### Cheetah speed

- Cheetahs run faster than humans.
- Cheetahs can run 100 meters in 6.4 seconds, so they are the fastest land animal.
- Scientists found that a cheetah can go from a speed equals zero to a speed equals 96.5 kilometers per hour (kph) in 3 seconds only (that represents three strides of the cheetah).

#### Note

A high-speed train can go from a speed equals zero to a speed equals 96.5 kph in 37 seconds, while a fast car can reach this speed in more than 4 seconds.

- Discuss with your child how the cheetah is the fastest animal in the world.



• Speed is what distinguishes the cheetah from other animals and this helps it to survive as a predator.

► **The speed of the cheetah is the result of some special physical characteristics, where :**

**1 Its head :**

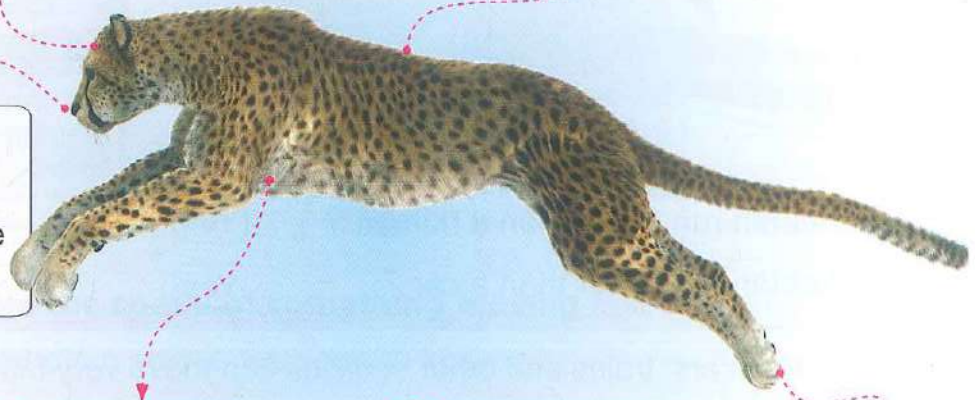
Cheetah's head is low to the shoulder, which decreases the air resistance (friction of air).

**5 Its spine :**

Cheetah's spine (backbone) is flexible and acts like a spring for its leg muscles.

**2 Its nose :**

Cheetah's nose has large openings, which help it breathe a lot of air.



**3 Its heart :**

Cheetah has a large, oversized powerful heart.

**4 Its claws :**

Cheetah sticks its claws into the ground while running to push off the ground, which makes it faster.

**6 Its body :**

Cheetah's body is lightweight, where the average weight of its male is about 41 – 45 kg.



**Check your understanding**

► **Complete the following sentences :**

1. Cheetah's body is lightweight that helps it to run ..... than a car.
2. Cheetah's head is low to the shoulder, which decreases .....
3. Cheetah sticks its ..... into the ground to make it faster during running.

**Notes for parents**

- Help your child to find out some online sources to learn more about the cheetah and its amazing physical characteristics that help it to be the fastest animal in the world.







### Activity 3

## Objects Move at Different Speeds

### The relationship between distance, time and speed

Each of the following objects travels different distances in the same amount of time (4 minutes), as shown in the following table :

Moving objects	Distance	Time
 Runner	1.5 kilometer	4 minutes
 Horse	3 kilometers	4 minutes
 Car	6 kilometers	4 minutes
 Rocket	400 kilometers	4 minutes

► From the previous table we can conclude that :

A runner, horse, car or rocket can travel **different distances** in the **same amount of time**, because they have different speeds.

- Discuss with your child that different moving objects have different speeds, so they can travel different distances in the same amount of time.



- How do you know which is the fastest one in the previous table ?
  - The fastest is the one who travels a longer distance in the same amount of time.
  - So, the rocket is the fastest one.



### Check your understanding

#### ► Put (✓) or (✗) :

1. If different objects travel in the same amount of time, they will travel the same distance. (     )
2. A horse can run a longer distance than a car in the same amount of time. (     )
3. The speed of an object depends on the distance covered by this object and the time taken by the object to travel that distance. (     )

#### In the Exercises Book :

Try to answer :

- Exercises on Lesson ① p. 41
- Self-Assessment ⑪

#### Notes for parents

- Let your child answer the questions to check his/her understanding.



## Basics of Speed

► Look at the following pictures, then answer the question :



- Does the car which is on the highway move at a different speed than the cars that are stuck in a traffic jam ?  Yes  No
- From the previous question, we can conclude that objects move at different speeds around us all the time.

## Basics of speed

- Speed is a measurement of how fast something is moving.
- Speed measures the distance that an object travels over time.
- The speed of an object is not affected by the **direction** of this moving object.

## Example :

If a car moves forward 5 meters in one second, then it moves backward 5 meters in one second, so its speed is still 5 meters per second.

## Speed :

It is the distance traveled in a certain amount of time.

- Speed is estimated in unit of distance over unit of time therefore, to calculate an object's speed, divide the **distance** it travels by the **time** it takes to travel that distance :

$$\text{Speed} = \text{Distance} \div \text{Time}$$

So, speed can be defined also as, **distance per unit of time**.

- Discuss with your child the mathematical relation between speed, distance and time.



## Some common measuring units of speed

Meters per second (m/sec).

Kilometers per hour (km/hr or kph).

### ► To compare the speed of one object to the speed of another object :

#### 1. Measure the distance that both objects travel in the **same amount of time**.

- The object that travels **the greater distance** in the same amount of time is moving at a greater speed.

#### - Example :

If one runner travels 6 kilometers in 1 hour, and a second runner travels 9 kilometers in 1 hour.

So, the second runner is moving at a greater speed, because he travels a greater distance (9 km) in the same amount of time (1 hour).



#### 2. Measure the time that both objects take to travel **the same distance**.

- The object that travels the same distance in the **smaller amount of time** is moving at a greater speed.

#### - Example :

If two cars are racing 1000 meters, the car that finishes the race in the smaller time is moving at a greater speed.



## Check your understanding

### ► Complete the following sentences :

1. A car that travels 90 kilometers per hour, this car is ..... than a car that travels 60 kilometers per hour.
2. Two bicycles are racing 500 meters, the bicycle that finishes the race in the greater time is ..... than the bicycle that finishes in the smaller time.
3. The distance per unit of time is known as .....

## Notes for parents

- Help your child to know the different measuring units of speed.



## Activity 5

# Measuring an Object's Motion

- ▶ You have learnt that speed is the measurement of how fast something is moving, where :

Faster moving things have higher speeds.



Slower moving things have lower speeds.



### How to find out the speed

- The distance between two places is how far these places are from each other.
- How long it takes to travel a distance depends on how fast you are moving.

#### Example :

If you **walk** from your house to your school, it will take a **longer** time to get there than if you travel the same distance using a bicycle.



#### ⚡ Note

Airplanes and high-speed trains can cover a long distance in a short period of time.

- ▶ You can calculate the speed of a moving object by doing some simple math as follows :

First, you must know **the distance** traveled by this object.

Then, you need to know **the time** taken by this object to travel that distance.

To find the speed, you **divide** the distance by the time.

$$\text{Speed} = \text{Distance} \div \text{Time}$$

- Help your child to know how to calculate the speed of different moving objects.



### Examples :

1. If your school is 3 kilometers away from your house and it took 1 hour to walk there, calculate your rate of speed.

$$\text{Speed} = \text{Distance} \div \text{Time}$$
$$\text{Speed} = 3 \div 1 = 3 \text{ km/hr.}$$

Distance = 3 km.  
Time = 1 hour

2. If a bus traveled 600 kilometers in 6 hours, calculate the average of the bus speed.

$$\text{Speed} = \text{Distance} \div \text{Time}$$
$$\text{Speed} = 600 \div 6 = 100 \text{ km/hr.}$$

Distance = 600 km.  
Time = 6 hours



### Check your understanding

#### ► Complete the following sentences :

1. If the club is 4 kilometers away from your house and it took 1 hour to walk there, your rate of speed would be ..... km/hr.
2. If the speed of a car is 100 km/hr, while the speed of an airplane is 500 km/hr, this means that the speed of the car is ..... than the speed of the airplane.

#### ► Choose the correct answer :

If a boy rides a bike and covers 50 meters in 5 seconds, so the rate of speed will be .....

- a. 10 km/hr.                      b. 10 m/sec.                      c. 10 km/sec.                      d. 10 m/hr.

#### In the Exercises Book :

Try to answer :

- Exercises on Lesson (2) p. 45
- Self-Assessment (12)

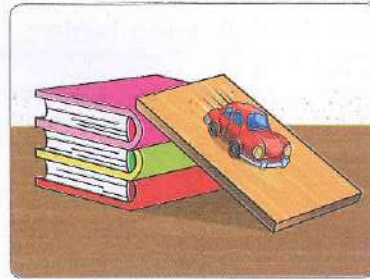
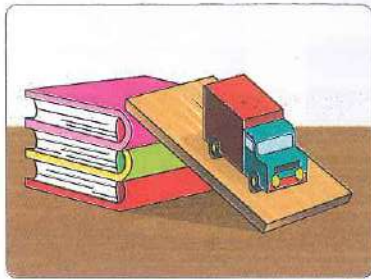
### Notes for parents

- Let your child answer the questions to check his/her understanding.



# Measuring Speed

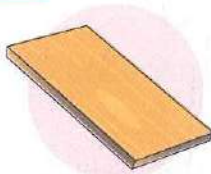
▶ Look at the following two figures, then answer the question :



• The truck and the car travel down the ramp at different speeds ? Yes No

▶ In this activity, we will measure the speed of various balls traveling down a ramp.

### Tools



30 cm ramp



Books



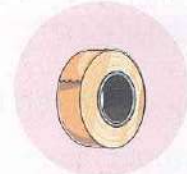
3 balls with different masses



Stopwatch



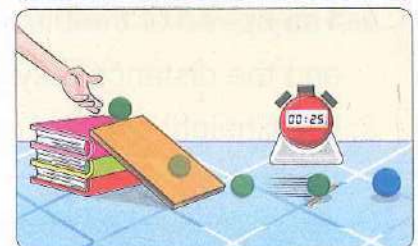
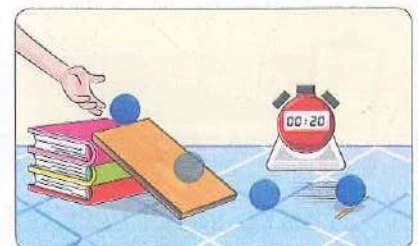
Measuring tape



Masking tape

### Steps

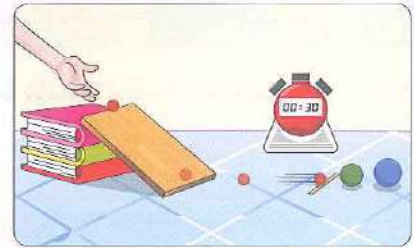
1. Set up the ramp, as shown in the figure.
2. Measure 1 meter from the end of the ramp and place a piece of masking tape on the floor as a finish line.
3. Roll the three different balls gently down the ramp without pushing them, one at a time.



• Help your child to do this activity at home.



4. Start the stopwatch as you release each ball, then stop the stopwatch when the ball passes the finish line.



5. Record the results in the following table :

Balls	Time (seconds)
Blue ball	20 sec.
Green ball	25 sec.
Red ball	30 sec.

### ▶ Observations

- The blue ball which has the **biggest** mass reaches the finish line in 20 seconds, so it has the **fastest** speed.
- The red ball which has the **smallest** mass travels the same distance in 30 seconds, so it has the **slowest** speed.
- The green ball which has the medium mass travels the same distance in 25 seconds, so it has the medium speed.

### ▶ Conclusion

The **speed** of each ball depends on the **mass** of this ball.

### 💡 Note

The speed of the ball can be changed, by changing the height of the ramp or the type of the ramp's surface (smooth or rough).



### Check your understanding

▶ Put (✓) or (✗) :

1. The speed of balls differs according to their mass. ( )
2. The speed of the blue ball and the red ball differed, even though the ramp and the distance stay the same. ( )
3. If the height of the ramp decreases, the speed of the ball will decrease. ( )

### Notes for parents

- Discuss with your child how the mass of a moving object affects its speed.

### In the Exercises Book :

Try to answer :

- Exercises on Lesson (3) p. 48
- Self-Assessment (13)



# Calculating Speed

► Look at the following pictures, then put (✓) in front of the picture that has the highest speed :



• You have learnt a lot about speed, time and distance, where :

$$\text{Speed} = \text{Distance} \div \text{Time} = \frac{\text{Distance}}{\text{Time}}$$

• **Now**, let's use what you have learnt to calculate the speed of different moving objects.

### Calculating speed

Let's see an example that shows how to calculate the speed of two different-colored cars.

**A yellow car moves 10 meters in 5 seconds, a green car moves 20 meters in 5 seconds. What are the speeds of the two cars ? And which car moves faster ?**



- Calculate the speed of the yellow car :

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{10}{5}$$

$$\text{Speed} = 2 \text{ m/sec.}$$



- Calculate the speed of the green car :

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{20}{5}$$

$$\text{Speed} = 4 \text{ m/sec.}$$

• Discuss with your child the mathematical relation used to calculate the speed of moving objects.



► **From the previous results, we can conclude that :**

The yellow car travels 2 meters in 1 second, while the green car travels 4 meters in 1 second.

So, the green car travels greater distance than the yellow car in the same time which is 1 second, so the green car is faster than the yellow one.

 **Note**

In the previous example, the two cars move **within the same time** which is 5 seconds, so in this case we can determine the faster car through observing the distance that each car travels in 5 seconds, where :

- The yellow car traveled 10 meters.
- The green car traveled 20 meters.

So, the green car is faster than the yellow one.

► **Look at the two solved problems and try to solve problems (3) and (4) :**

**Problem (1)**

Amir rides his bike 10 kilometers in 1 hour.

How fast is he going ?

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{10}{1}$$

$$\text{Speed} = 10 \text{ km/hr.}$$

Distance = 10 km.  
Time = 1 hour

**Problem (2)**

Nour rides her bike 20 kilometers in 2 hours.

How fast is she going ?

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{20}{2}$$

$$\text{Speed} = 10 \text{ km/hr.}$$

Distance = 20 km.  
Time = 2 hours

**Notes for parents**

- Help your child to solve more problems on calculating speed of moving objects.



### Problem (3)

Omar rides his bike 15 kilometers in 3 hours.

How fast is he going ?

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{\dots\dots\dots}{\dots\dots\dots}$$

$$\text{Speed} = \dots\dots\dots \text{ km/hr.}$$

Distance = 15 km.  
Time = 3 hours

### Problem (4)

Rana rides her bike 30 kilometers in 2 hours.

How fast is she going ?

$$\text{Speed} = \frac{\dots\dots\dots}{\dots\dots\dots}$$

$$\text{Speed} = \frac{\dots\dots\dots}{\dots\dots\dots}$$

$$\text{Speed} = \dots\dots\dots \text{ km/hr.}$$

Distance = ..... km.  
Time = ..... hours

- From the previous problems, you will find out that Rana is the fastest rider, because she was moving at the fastest rate of speed.



### Check your understanding

► Solve the following problem, then answer the question :

If Adel runs 18 meters in 6 seconds, while Nada runs 10 meters in 5 seconds.

1. Calculate the speed of Adel and Nada.

.....  
.....  
.....

2. Which one is faster ? Why ?

.....  
.....

• Let your child answer the questions to check his/her understanding.

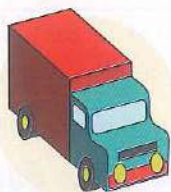


## Activity 8

# Racing Downhill

- You have learnt about speed and energy, in this activity you will measure the speed and the kinetic energy of an object moving down a cardboard tube at various incline angles.
- **Now**, let's study the relation between speed and kinetic energy.

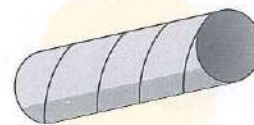
### Tools



Toy truck



Metric ruler



Cardboard paper towel tube



Paper cup



Stopwatch



Scissors

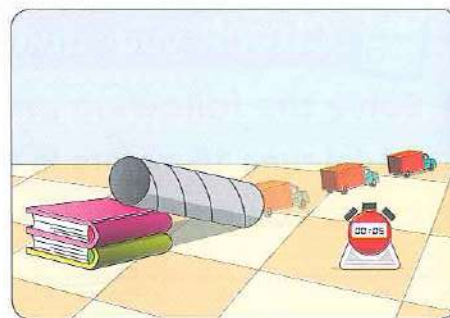


Books

### Steps

#### Part (1) : The relation between the speed and the angle of incline.

1. Put one end of the tube on the top of two books, and the other end of the tube resting on the ground.
2. Record in a table the number of books used to set up the tube in the column "**Number of books**".
3. Roll the truck down the tube, use the stopwatch to determine the time, and record in the table how long the truck takes to travel to the end of the tube in the column "**Time to travel**".
4. Add one book to change the incline angle and repeat the steps, then add another book and repeat the steps again.



**(Note : As the "Time of travel" decreases, the speed of the toy truck increases).**

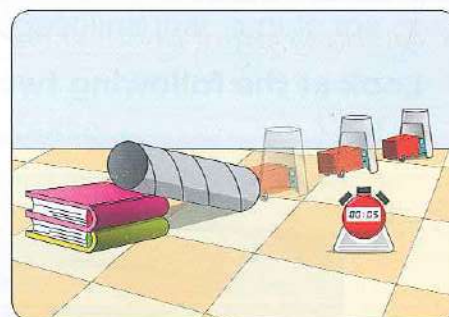
#### Notes for parents

- Discuss with your child the relation between the speed and kinetic energy of an object that moves on a ramp and the angle of incline.



**Part (2) : The relation between the kinetic energy and the angle of incline.**

5. Now, repeat each incline, but place the paper cup at the bottom of the tube as shown in the figure.
6. Measure the distance the cup moves after each time the truck rolls into it, and record in the table the distance that the cup travels in the column "Distance the cup traveled"



**(Note : As the "Distance the cup traveled" increases, the kinetic energy of the toy truck increases).**

Number of books	Part (1)	Part (2)
	Time to travel	Distance the cup traveled
2 books	5 seconds	3 cm
3 books	3 seconds	4 cm
4 books	2 seconds	7 cm

**Observations**

- As the angle of incline increases, the speed of the truck increases as it takes less time to reach the end of the tube.
- As the angle of incline increases, the distance that the paper cup traveled increases.

**Conclusions**

- As the speed of a moving object increases, its kinetic energy increases.
- Both speed and kinetic energy increase, as the angle of incline increases.



**Check your understanding**

▶ **Complete the following sentences using the words below :**

(increases – faster – kinetic)

1. If the incline of a ramp increases, the object on it will move .....
2. When the speed of an object increases, its kinetic energy .....
3. We can use the speed of an object to measure the ..... energy of this object.

**In the Exercises Book :**

Try to answer :

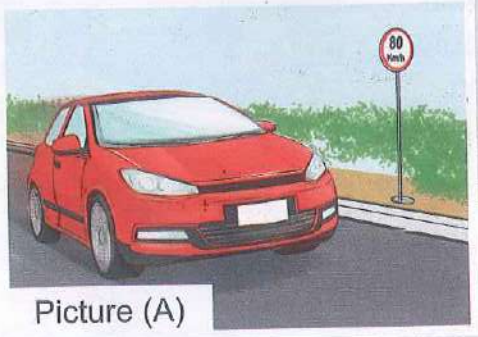
- Exercises on Lesson (4) p. 50
- Self-Assessment (14)

• Let your child answer the questions to check his/her understanding.

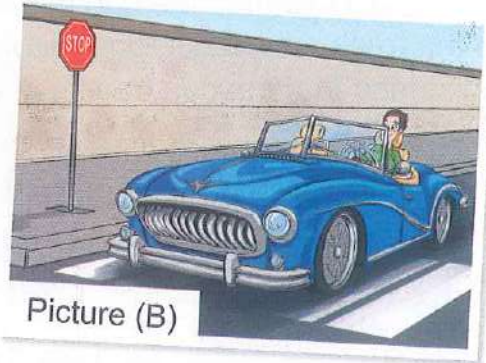


## Changing Speed

► Look at the following two pictures, then answer the question :



Picture (A)



Picture (B)

In which of the two pictures the driver should press the pedal of the car brakes to slow down the speed of the car ?

### Changing speed

If you want an object to move faster, you must give it more kinetic energy, while if you want an object to move slower, you must reduce its kinetic energy.

► **Forces make objects move :**

- When a force is used to push an object, the speed of the object depends upon the force used.
- When **more force** is applied to an object, its **speed increases**.
- When the **speed** of a moving object **increases**, its **kinetic energy increases**.

**Now**, let's take an example to show how forces make objects move :

► **If a driver wants a car to go faster :**

- He presses the gas pedal to send more gasoline into the engine.
- This allows the engine to convert more chemical potential energy in the gas into kinetic energy in the engine.
- The produced kinetic energy provides the force that turns the wheels faster, so the car speeds up.

### Notes for parents

- Discuss with your child how forces affect the speed of a moving object.



► **If a driver wants a car to slow down :**

- He takes his foot off the gas pedal, so the amount of gasoline that sent to the engine decreases.
- The produced kinetic energy from the engine will decrease.
- So, the car will slow down gradually until it will stop, due to the **friction force** between the car's tires and the road.

► **From the previous example, we can conclude that :**

We can make a car speed up and slow down by increasing or reducing the force applied to the vehicle to change the speed.



**Check your understanding**

► **Put (✓) or (✗) :**

1. If an object goes faster, this means that it has less kinetic energy. ( )
2. When a driver presses more on the gas pedal, the car moves faster. ( )



**Optional Digital Activity**

Activity (10) " RC Racing Cars " in the school book is an optional digital activity. You can do this activity by scanning its QR code found in your school book.

• Let your child answer the questions to check his/her understanding.



## Activity 11

# Train Race

- Use what you know about speed to compare two toy trains in the scenario given :

Ahmed likes toy trains, so he wants to get a new toy train that is faster than the one he has now.

The catalog of the new train shows that it travels 4 meters every 8 seconds.

Ahmed tested his old train on his 3-meter track, so he could compare its speed to the speed of the new train in the catalog.

He found that his old train traveled 3 meters in 12 seconds.

**Should Ahmed buy the new train ? Explain your answer using calculations of speed from the data.**



**The answer :**

The speed of the old train

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{3}{12} = \frac{1}{4}$$

$$\text{Speed} = 0.25 \text{ m/sec.}$$

The speed of the new train

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Speed} = \frac{4}{8} = \frac{1}{2}$$

$$\text{Speed} = 0.5 \text{ m/sec.}$$

Ahmed found that his old train moves at a rate of  $\frac{1}{4}$  (0.25) meter per second, while the new train can move at a rate of  $\frac{1}{2}$  (0.5) meter per second, so Ahmed should buy the new train, because it is faster than his old train.



## Check your understanding

- Put (✓) in front of the faster one :

1. If two cars are moving on the road, the speed of the first car is 6 m/sec and the speed of the second car is 8 m/sec, which one is the faster ?

The first car.

The second car.

2. Rana rides her bike 20 kilometers in 2 hours and Noha rides her bike 15 kilometers in 3 hours, which one is the faster ?

Rana.

Noha.

**In the Exercises Book :**

Try to answer :

- Exercises on Lesson (5) p. 54
- Self-Assessment (15)

## Notes for parents

- Let your child answer the questions to check his/her understanding.



## Activity 12

# Record Evidence like A Scientist

- ▶ In this concept, you have learnt a lot about speed and how we can measure it for different moving objects.
- **Now**, try to think like a scientist by writing your hypothesis (claim), your evidence and your scientific explanation about one of the main points of this concept through the four steps you have learnt in the previous concepts.

### Step 1 The Question

How can you measure the speed of something moving fast ?

### Step 2 My Hypothesis (Claim)

.....

.....

.....

### Step 3 My Evidence

.....

.....

.....

.....

### Step 4 My Scientific Explanation

.....

.....

.....

.....

.....

- Help your child to think like a scientist by answering a question about one of the main points of this concept, then write his/her hypothesis, evidence and scientific explanation.



# Lesson 6

## Activity 13

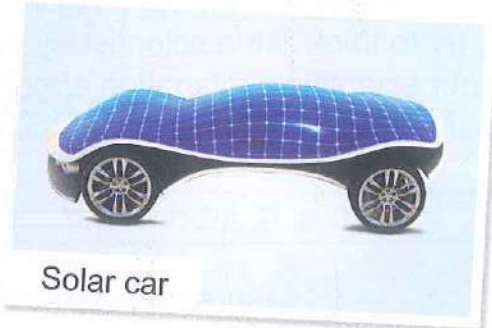
# STEM in Action

- Look at the following two pictures, then put (✓) in front of the correct answer :



Normal car

Car (A)



Solar car

Car (B)

From the previous two pictures, which car will pollute the air and cause climate change ?

Car (A)

Car (B)

- Have you ever thought about designing a car ?

Mechanical engineers design cars and think about how to use energy to power these cars in creative ways.

### Solar vehicles

- Most cars are powered by gasoline as a fuel, but these cars produce exhausts that pollute the air and cause climate change.
- While, other vehicles are powered by electricity, but these electric vehicles have batteries that must be charged from time to time.



- Can you imagine a car that never has to stop for gas or a charge ?

- Mechanical engineers design vehicles that are powered by **the Sun** (solar energy).
- But, there are some difficulties in solar vehicles, because the amount of energy we can get from the Sun is not as great as the amount of energy we get from gasoline or an electric battery.
- So, engineers reduce the weight of the solar vehicles to make them drive as quickly as normal (conventional) vehicles.

### Notes for parents

- Discuss with your child how mechanical engineers use solar energy to power solar vehicles.



- **Now**, let's know the advantages and the disadvantages of using the solar vehicles :

Advantages of using solar vehicles	Disadvantages of using solar vehicles
<ul style="list-style-type: none"> <li>• Don't need gasoline (fuel).</li> <li>• Don't need to charge their batteries using electricity.</li> <li>• Don't cause air pollution or climate change.</li> </ul>	<p>The amount of energy that we can get from the Sun is not as great as the amount of energy that we can get from gasoline or electric batteries.</p>

- The solar vehicle is so lightweight, because engineers exclude (remove) most devices from the car such as "speedometer" that shows the drivers the car speed. But without a speedometer, how can we know the speed of the solar vehicle ?

- In the following steps, you will design a way to calculate the solar vehicle's speed, where the fastest solar vehicle can go about 88 kilometers per hour.



Solar vehicle

### Calculating the speed of a solar vehicle :

1. We need to know the time and the distance it traveled.
2. Place two marks at a set distance from each other.
3. Record the time at which the vehicle passed between the two marks.
4. Divide the distance covered between the two marks by the time recorded to get the speed.



### Check your understanding

► Put (✓) or (✗) :

1. The exhausts produced from the electric vehicles cause climate change. ( )
2. The amount of energy we can get from the Sun is greater than the amount of energy we get from gasoline. ( )
3. Reducing the weight of the vehicle makes it move faster. ( )

#### In the Exercises Book :

Try to answer :

- Exercises on Lesson (6) p. 57
- Self-Assessment (16)
- Model Exam on Concept (2.3)

• Discuss with your child the advantages and the disadvantages of using the solar vehicles.



## Activity 14

# Review : Speed

► We can summarize this concept in the following main points :

- **Cheetah** is the fastest land animal on the planet.
- The speed of the cheetah is the result of some special physical characteristics, where :
  1. Its head is low to the shoulder, which decreases the air resistance.
  2. Its nose has large openings, which help it breathe a lot of air.
  3. It has a large, oversized powerful heart.
  4. It sticks its claws into the ground while running to push off the ground, which makes it faster.
  5. Its spine (backbone) is flexible and acts like a spring for its leg muscles.
  6. Its body is lightweight, where the average weight of its male is about 41 – 45 kg.

### Speed :

It is the distance traveled in a certain amount of time.

$$\text{Speed} = \text{Distance} \div \text{Time} = \frac{\text{Distance}}{\text{Time}}$$

• **Some common measuring units of speed :**

- Meters per second (m/sec).
  - Kilometers per hour (km/hr or kph).
  - The object that travels the **greater distance** in the same amount of time is moving at a greater speed.
  - The object that travels the same distance in the **smaller amount of time** is moving at a greater speed.
- 
- The speed of an object depends on its mass.
  - As the speed of a moving object increases, its kinetic energy increases.
  - Both speed and kinetic energy increase, as the angle of incline increases.
  - We can make a car speed up and slow down by increasing or reducing the force applied to the vehicle to change the speed.
  - Most cars are powered by gasoline that pollute the air and cause climate change, while

### Notes for parents

- Help your child review the main points in this concept.



electric vehicles have batteries that must be charged from time to time.

- Mechanical engineers design vehicles that are powered by the Sun (solar energy).

- **Advantages of using solar vehicles :**

- Don't need gasoline.
- Don't need to be charged.
- Don't cause climate change.

- **Disadvantages of using solar vehicles :**

The amount of energy that we can get from the Sun is not as great as the amount of energy that we can get from gasoline or electric batteries.

- The solar vehicle is so lightweight, because engineers exclude (remove) most devices from the car such as "speedometer" that shows the drivers the car speed.



Concept

2.4

# Energy and Collisions







## Learning outcomes

**By the end of this concept, your child will be able to :**

- Analyze and interpret data to describe how the speed and mass of objects relate to changes observed in a collision.
- Construct an explanation based on evidence and logical reasoning to describe energy transfer in a collision.
- Apply mathematical thinking to organize data to represent patterns related to mass, speed and the energy of objects.

## Key vocabulary

- Collision.
- Mass.



# Can You Explain?

- More mass
- More speed
- More energy



- Less mass
- Less speed
- Less energy

### ► What happens to objects when they collide with each other ?

- When an object (as a truck) hits another object (as a car) we observe that :
  - Energy is transferred when objects hit (collide with) each other.
  - A faster and heavier (more mass) object has more energy than a slower and lighter (less mass) object.

**Therefore,** the faster and heavier object that has more energy causes more damage than the slower and lighter object that has less energy.

### Example of collision

#### A wrecking ball :

- It is a very heavy steel ball that swings on a cable.
- The wrecking ball is used to collide with walls of a building to help construction workers knock down walls or parts of buildings.



Wrecking ball

### ► In this concept, we will study :

- Collision of objects.
- Energy and collision.
- The effect of speed and mass on collisions.
- Energy conversions during a collision.

### Notes for parents

- Discuss with your child that faster and heavier objects have more energy than slower and lighter objects.



## Activity 2

# Collision

- ▶ You have learnt that energy transfers from one object to another.
- Look at this picture, then complete the sentences by using these words.

(different - kinetic - increases).

1. The bat transfers its ..... energy to the ball.
2. When the bat hits the ball, the ball will move in a ..... direction than its moving direction.
3. The speed of the ball ..... when the bat hits it.



### The collision in cricket

- A cricket is a popular game all over the world.
- In cricket, a player uses a wooden bat to hit a ball.
- The cricket player holds a bat and moves it as the ball comes towards him at high speed to collide with the bat.



- ▶ What happens to the energy of the moving bat when it hits the moving ball ?
- The bat transfers its kinetic energy to the ball.
- Then, the speed of the ball increases and the ball returns back in a different direction.
- This collision produces a popping sound and the player would feel the bat hitting the ball.



### Check your understanding

#### ▶ Put (✓) or (✗):

1. During the collision between a ball and a bat, the direction of the ball will not change. ( )
2. During the collision between a ball and a bat, the kinetic energy transfers from the bat to the ball. ( )

- Help your child to know that kinetic energy can transfer from one object to another.



## Activity 3

# Watching Objects Collide

### ► What happens to the driver's body when the car stops suddenly ?

- The driver's body continues to move forward, where the objects that are in motion stay in motion until something stops them.
- **But**, What are the safety equipment that keep the driver and the passengers in their places ?



### Safety equipment used during collision of cars

#### 1 Seatbelts :

They are used in cars to keep the driver and also the passengers from moving forward when the car stops suddenly, so seatbelts have saved thousands of lives.



#### 2 Airbags :

##### Their structure :

Airbags are made up of **thin, nylon material** folded into the **steering wheel, seats, dashboard or doors**.

##### Idea of operation :

- During a crash, airbags inflate automatically when sensors in the car detect a crash.
  - A sensor tells the airbags to inflate and fill with a gas to provide a soft cushion.
  - After collision, the airbags deflate almost as fast as they inflate, because they have holes or vents to allow them to deflate, so the driver can get out of the car.



##### Their importance :

- Airbags slow the speed of the driver moving forward.
- Airbags absorb the energy of the car due to its collision.

### Notes for parents

- Help your child to find out some online sources to learn more about the seatbelts and airbags and their importance for our life during accidents.



## Collisions between trains and cars

- There are many accidents in which a train hits a car that may be stuck on the train tracks.
- Trains are much larger than cars. Also, trains travel at higher speed than cars.
- It is more dangerous, as the force of the collision between the cars and trains increases.



### Check your understanding

#### ► Complete the following sentences :

1. From safety equipment of cars during collision are ..... and .....
2. Airbags are made up of ..... material.
3. In cars, ..... protect passengers during collision, where they inflate automatically when sensors in the car detect a crash.

#### In the Exercises Book :

Try to answer :

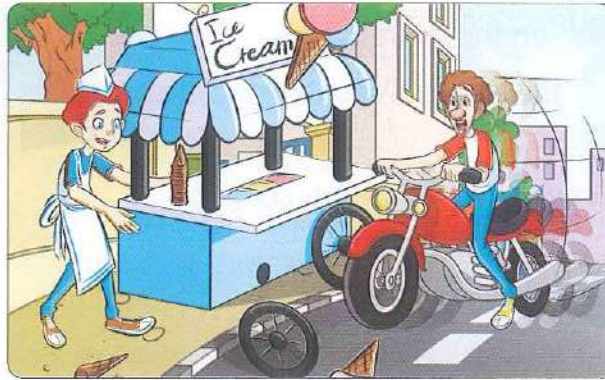
- Exercises on Lesson (1) p. 59
- Self-Assessment (17)

• Let your child answer the questions to check his/her understanding.



## Energy and Collisions

► Look at these pictures, then put (✓) or (✗):



1. During collision between two objects, there is no change of energy occur. (    )
2. The motorcycle has a potential energy as it is running on the street. (    )
3. The kinetic energy of the motorcycle transfers to the ice cream cart during collision. (    )

## Energy and collisions

- When two objects bump or crash with each other, we can say a **collision** happens between them.

**Collision:**

It is the moment where two objects hit or make contact in a forceful way.

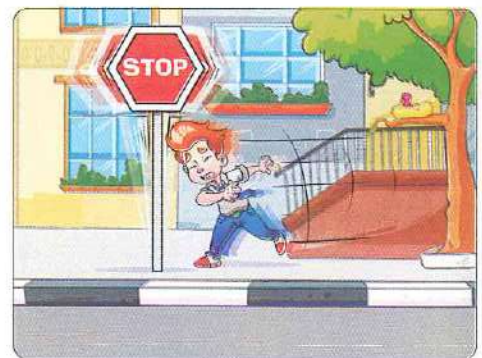
- When two objects collide with each other, an energy transfer occurs and also changes of energy occur.

## Example of collision between two objects

What happens if you are running down the street without looking in front of you and hit a traffic sign post ?

► In this situation :

- You will stop moving forward.
- You may bounce off and get hurt.
- The traffic sign post may vibrate (wobble).



## Notes for parents

- Discuss with your child the meaning of collision and let him/her mention some other examples.



► In the previous example, what are the changes and transfer of energy that take place ?

- The kinetic energy transfers from your body to the traffic sign post. This leads to the vibration of the traffic sign post.
- A part of your kinetic energy changes into a sound energy (the sound you hear on collision).



### Check your understanding

► Look at the following picture, then complete the sentences using these words :

bread – kinetic – collide – cart

1. The bicycle has ..... energy as it is running on the street.
2. When the cyclist ..... with the bread cart, the kinetic energy of the bicycle transfers to the ..... and the ....., that causes the cart tips over and the bread scatters.



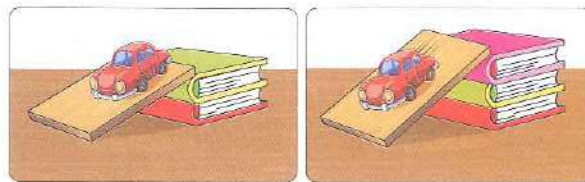
• Let your child answer the questions to check his/her understanding.



## Activity 5

# The Effect of Speed on Collisions

- ▶ From the previous concept, you have learnt that as the inclined of the slope increases, the speed of the object increases.



- **Now**, we are going to study the effect of speed on collisions.
- The amount of kinetic energy of an object depends on its **speed** as the **speed** of an object **increases** the **kinetic energy** of this object **increases**.
- ▶ When a speeding object hits another object, the speeding object transfers some of its energy to the other object, where :

- By increasing the speed of the object, the energy that it transfers during collision will increase.
- Some of this transferred energy may be in the form of heat, light or sound.



- ▶ Comparison between a fast-moving object and a slow-moving object :

Fast-moving object	Slow-moving object
<ul style="list-style-type: none"> <li>• It has <b>more (extra) energy</b>.</li> </ul>	<ul style="list-style-type: none"> <li>• It has <b>less energy</b>.</li> </ul>
<ul style="list-style-type: none"> <li>• When this object hits another object, it exerts <b>more force</b>.</li> </ul>	<ul style="list-style-type: none"> <li>• When this object hits another object, it exerts <b>less force</b>.</li> </ul>
<ul style="list-style-type: none"> <li>• This force causes a big damage to the object that cannot be repaired.</li> </ul>	<ul style="list-style-type: none"> <li>• This force causes less damage to this object than the fast-moving object.</li> </ul>

### Notes for parents

- Discuss with your child the effect of speed on collisions.





### Note

Driving fast is very dangerous, where if a car increases its speed, its kinetic energy increases that results in exerting a large force during an accident.

## ? What happens if ... ?

### 1. Two cars move at different speeds in an opposite direction collide with each other ?

The forces exerted in the accident depend on the speed of both cars, so the **damage would be much more severe** because they move in opposite direction.



### 2. Two cars move at different speeds in the same direction collide with each other ?

The forces exerted in the accident depend on the speed of both cars, this leads to damage would be less severe because they move in the same direction.



## Check your understanding

### ► Complete the following sentences :

1. The amount of kinetic energy of an object depends on the ..... of this object.
2. Fast-moving objects have ..... kinetic energy, while slow-moving objects have ..... kinetic energy.
3. By increasing the speed of an object, its kinetic energy .....

### In the Exercises Book :

#### Try to answer :

- Exercises on Lesson (2) p. 63
- Self-Assessment (18)

• Let your child answer the questions to check his/her understanding.

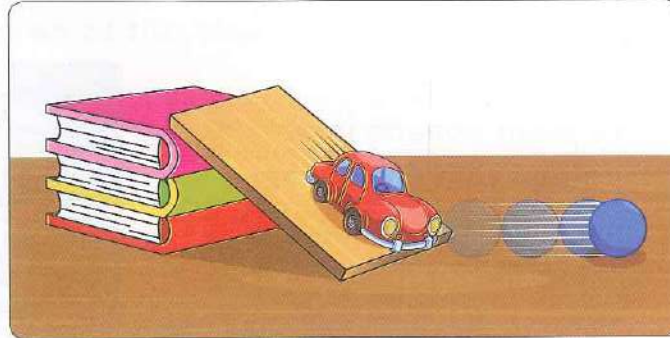


# Lesson 3

## Activity 6

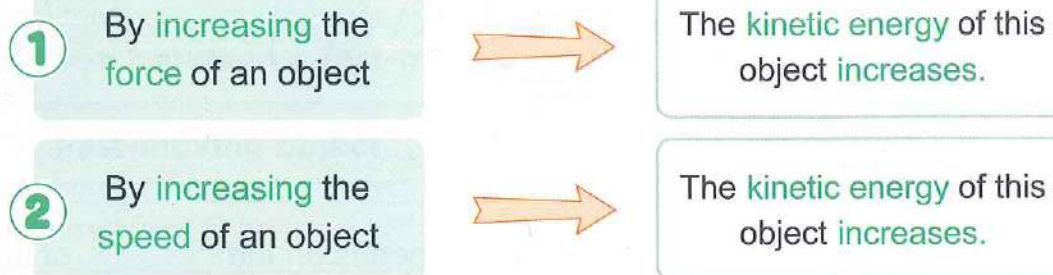
# Speed and Collisions

- Look at this picture which represents a toy car collides with a small ball, then choose the correct answer :



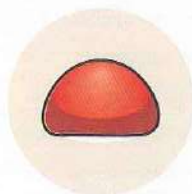
1. By increasing the speed of the car, the kinetic energy of this car .....  
(decreases – increases – doesn't change)
2. The ball moves a distance due to ..... of the car.  
(force – speed – force and speed)

- You have learnt from the previous lessons that :

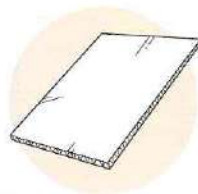


- **Now**, we are going to carry out an activity to show the effect of **force** and **speed** of a moving object on its kinetic energy during collision.

### ► Tools



Modeling clay



Piece of cardboard



Hard surface  
(wooden table)

### Notes for parents

- Discuss with your child the relation between force, speed and kinetic energy of a moving object.



## Steps

1. Roll a ball of clay in your hands and smoothing its sides.
2. Use the cardboard to make a landing platform, where the clay ball falls on and place this platform on a hard surface like a wooden table.
3. Hold the clay ball at a distance 1 meter above the platform.
4. Lightly open your hands to drop the clay ball onto the platform without throwing it.

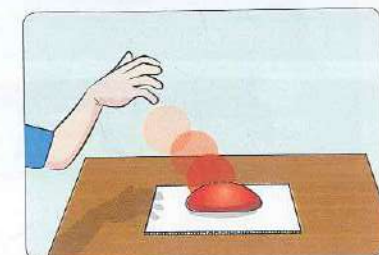
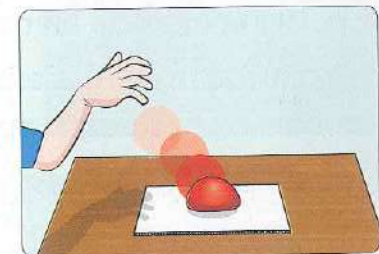
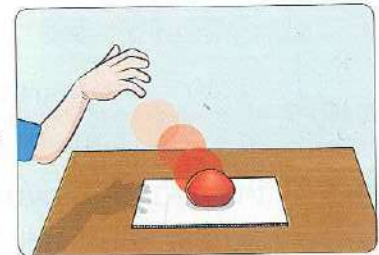
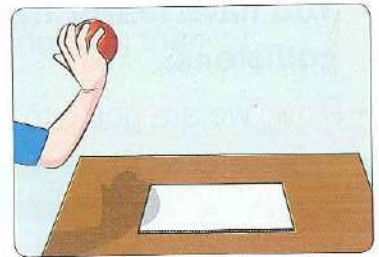
► **Observation** The shape of the clay ball changes a little and becomes irregular after dropping it.

5. Smooth the clay ball over and lift it up to 1 meter above the platform, then repeat the experiment again, but this time throw the clay ball with a gentle force to increase its speed.

► **Observation** The shape of the clay ball change more and becomes more irregular after throwing it gently.

6. Repeat the experiment one more time and throw the clay ball with a hard force, so its speed increases much more.

► **Observation** The shape of the ball changes much more and becomes completely irregular after throwing it hard.



## Conclusions

- As the **force** and **speed** of a moving object **increase**, the amount of its **kinetic energy increases** during collision.
- As the **kinetic energy** of a moving object **increases** during collision, **more damage** will happen to this object.



## Check your understanding

### Put (✓) or (✗) :

By increasing the force and speed of a moving object, its kinetic energy increases during collision. ( )

- Help your child to do this activity at home.



## Activity 7

# The Effect of Mass on Collisions

- ▶ You have learnt from the previous lessons the effect of speed on collisions.
- **Now**, we are going to study the effect of **mass** on collisions.

### The relation between the mass of objects and their kinetic energy

- Different vehicles have different masses, where a large truck has a much greater mass than a car.
  - If a large truck is traveling at the same speed of a car, the truck has more kinetic energy than the car, so the truck needs a bigger engine than the car.
  - As the vehicle moves faster, the amount of fuel that burns inside its engine increases to provide it with more kinetic energy.
  - As the mass of an object increases, its kinetic energy increases.
- From the previous explanation, we can conclude that if the truck and the car move at the same speed, we will find that :



#### The truck :

- Has a big mass.
- Has a big engine.
- Uses more fuel.
- Has more kinetic energy.



#### The car :

- Has a small mass.
- Has a small engine.
- Uses less fuel.
- Has less kinetic energy.

**G.R.**

**The truck that its mass is 1 ton has half the kinetic energy than another truck its mass 2 ton when they both move at the same speed.**

Because if the mass of an object increases, its kinetic energy at the same speed also increases.

### Notes for parents

- Discuss with your child the effect of mass on the collisions of moving objects.



## The effect of mass on collisions

- A large-mass vehicle causes more damage when it hits something than a small-mass vehicle traveling at the same speed.

### ? What happens if ... ?

1. A bicycle moves at a speed of 50 km/hr hits a person.

The bicycle will cause some injuries to this person, but he will survive.



2. A car moves at a speed of 50 km/hr hits a person.

The life of this person may be endangered.



### Check your understanding

#### ► Complete the following sentences :

1. A big truck has a ..... mass, while small car has a ..... mass.
2. When the mass of an object increases, its kinetic energy .....

#### In the Exercises Book :

##### Try to answer :

- Exercises on Lesson ③ p. 67
- Self-Assessment ⑱

- Let your child answer the questions to check his/her understanding.



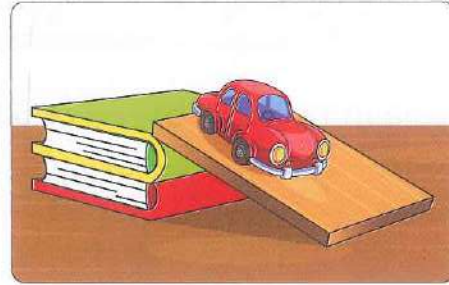
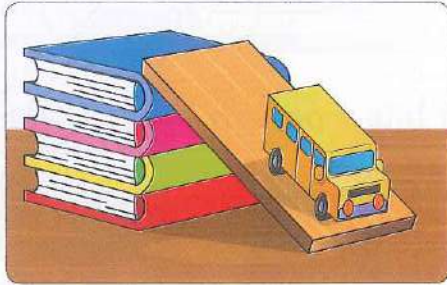
# Lesson 4

## Activity 8

# Mass in Collisions

► Look at these pictures, then complete the following sentences using these words :

speed - increases - greater - kinetic



1. By increasing the angle of the ramp, the speed of a moving object on this ramp .....
2. By increasing the mass of the moving object, its ..... energy increases.
3. The mass of the bus is ..... than the mass of the car.
4. As the mass of an object moves on a ramp increases, its ..... increases.

► In this lesson, we will study :

1. How does mass affect speed ?
2. How does mass affect kinetic energy ?

### 1 How does mass affect speed ?

We will carry out an experiment to show the relation between mass of objects and their speed.

#### ► Tools



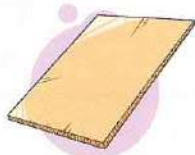
• 3 toy cars



• Balance (scale)



• 2 books



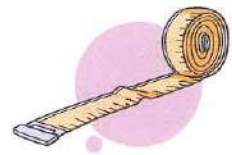
• Cardboard sheet



• Masking tape



• Stopwatch



• Meterstick

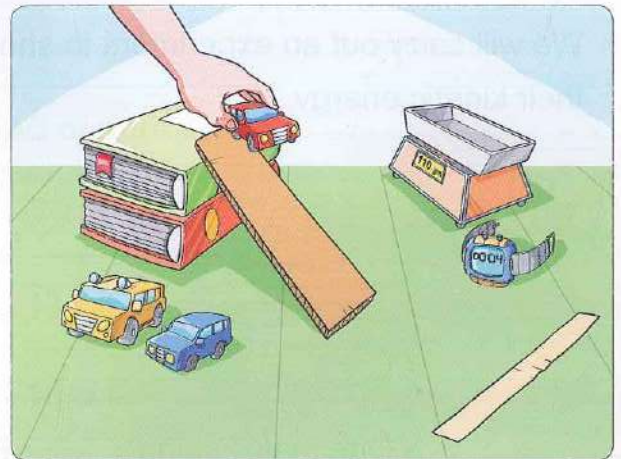
#### Notes for parents

- Help your child to do this activity at home.



### ► Steps

1. Use the cardboard to make a ramp.
2. Place one end of the cardboard ramp on the top of two books over each other, while the other end resting on the floor.
3. Mark a finish line with a piece of masking tape, where the distance between the tape and the end of the ramp is 1 meter.
4. Weigh the red car by using the balance and record its mass in the table below.
5. Release the car from the top of the ramp, while your friend hold a stopwatch to measure the time taken to cross the finish line, then calculate the speed of this car.
6. Repeat the previous steps using the blue car, then the yellow one and record their masses and the time taken by each of them to cover the same distance in the table below, then calculate the speed of each of them.



### ► Observations

The results of the three toy cars are :

Cars	Mass	Distance	Time	Speed = $\frac{\text{Distance}}{\text{Time}}$
Red car	110 gm.	1 m	4 sec.	$\frac{1}{4}$ m/sec.
Blue car	160 gm.	1 m	3 sec.	$\frac{1}{3}$ m/sec.
Yellow car	210 gm.	1 m	2 sec.	$\frac{1}{2}$ m/sec.

- According to the table above, we can observe that :  
By increasing the mass of the car, the time taken to cross the finish line decreases because the speed of the moving car on a ramp increases.

### ► Conclusion

The **speed** of the moving object on a ramp **increases** by **increasing** its **mass**.

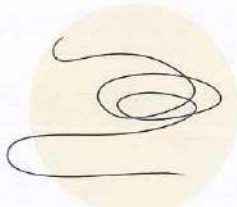
- Discuss with your child the effect of the mass of a moving object on its speed.



## 2 How does mass affect kinetic energy ?

We will carry out an experiment to show the relation between mass of objects and their kinetic energy.

### Tools



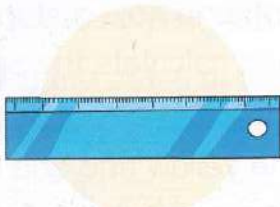
• One meter string



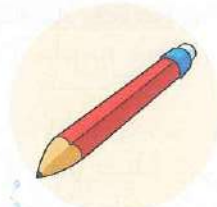
• Paper cup



• 3 toy cars



• Ruler



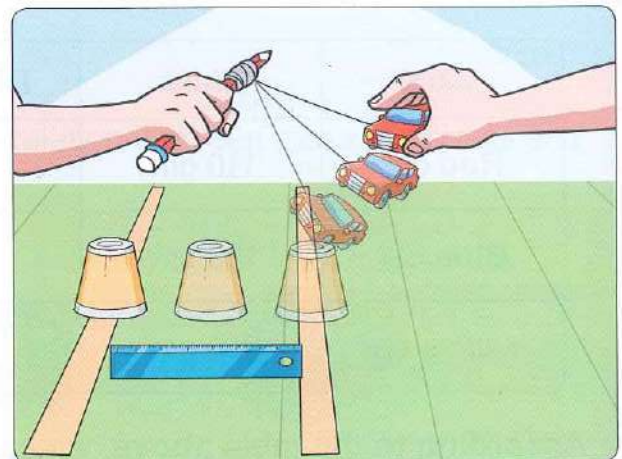
• Pencil



• Masking tape

### Steps

1. Tie one end of the string to a pencil and the other end to the red toy car.
2. Place the paper cup on the floor, and mark the cup's starting location on the floor with a piece of masking tape.
3. Hold the car straight out, so the cup is in the swinging path of the car when you let it go.
4. Release the toy car to collide with the paper cup.
5. Mark where the cup moved to using a piece of masking tape and then use the ruler to measure how far this is from the starting position.
6. Repeat the previous steps using the blue car, then the yellow one and record the results in another table.



### Notes for parents

- Help your child to do this activity at home.



## ▶ Observations

The results of the three toy cars are :

Cars	Moved distances
Red car	7 cm.
Blue car	12 cm.
Yellow car	15 cm.

## ▶ According to the table above, we can observe that :

By increasing the mass of the car, the distance that the paper cup travels increases.

## ▶ Conclusion

- By **increasing** the **mass** of an object that moves down a ramp, the **kinetic energy** of this object **increases**.



### Note

The speed and kinetic energy of a moving object on a ramp can be increased by :

1. Increasing the angle of the ramp.
2. Increasing the mass of the object.



## Check your understanding

### ▶ Put (✓) or (✗) :

1. By increasing the mass of an object that moves down a ramp, its speed decreases. ( )
2. By increasing the mass of an object that moves down a ramp, the kinetic energy of this object increases. ( )

### In the Exercises Book :

Try to answer :

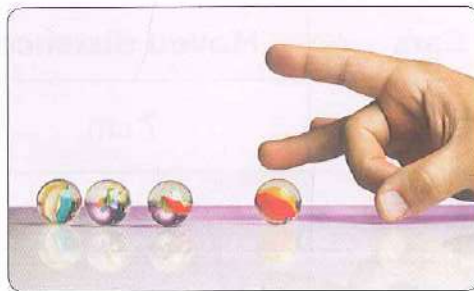
- Exercises on Lesson (4) p. 71
- Self-Assessment (20)

- Discuss with your child the effect of the mass of a moving object on its kinetic energy.



## Energy Conversions During a Collision

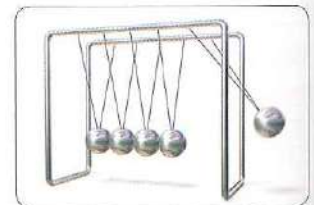
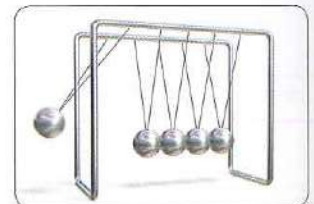
- Look at this picture, then put (✓) or (✗):



1. When you push your marble, the kinetic energy of your hand transfers to the marble. ( )
  2. During collision between marbles, some of kinetic energy of your marble changes into sound energy. ( )
- You have learnt that when two objects collide with each other, transfer and changes of energy take place such as :
- When you play a game with marbles, kinetic energy is transferred from your hand to the first marble, then there is another transfer of energy from your marble to the ones you hit.
  - Some of the kinetic energy is changed into sound energy when you hear the click sound during collisions between marbles.

## Energy conversions during a collision of Newton's cradle

- When the Newton's cradle ball is raised up without leaving it go, it stores potential energy and doesn't have any kinetic energy.
- When you leave the ball moves in the direction of the rest balls, the potential energy decreases gradually and changes into kinetic energy.
- Most of kinetic energy in the Newton's cradle is transferred from the first ball to the rest of balls, so the number of balls moving on both sides is equal.
- Some of kinetic energy of the first ball is changed into other forms of energy such as sound energy and thermal energy that are produced during collision, where :



## Notes for parents

- Discuss with your child how kinetic energy transfers between objects.



1. Some of this kinetic energy changes into sound energy that is produced during the collision between balls.
2. Some of this kinetic energy changes into thermal energy that is produced due to the friction between the string and the other parts of Newton's cradle and also during collision between balls.
3. Some of this kinetic energy changes into other forms of energy due to the friction of air with the ball during its movement.

 **Notes**

- If you leave the moving balls of Newton's cradle long enough, their kinetic energy decreases gradually until they stop after lots of collisions.
- Energy is conserved during collision, so it cannot be destroyed, but the amount of energy before the collision is equal to the amount of energy after the collision.



### Check your understanding

- Look at the opposite picture, then complete the following sentences using these words :

thermal – sound

When a car collides with a traffic sign post, a part of energy is changed into ..... energy that are you can hear, and some is changed into ..... energy due to the friction between the car and the traffic sign post.



**In the Exercises Book :**

Try to answer :

- Exercises on Lesson (5) p. 75
- Self-Assessment (21)

- Let your child answer the questions to check his/her understanding.



## Activity 10

# Record Evidence Like A Scientist

- ▶ In this concept, you have learnt about energy, collisions and the effect of speed and mass on collisions.
- **Now**, try to think like a scientist by writing your hypothesis (claim), your evidence and your scientific explanation about one of the main points of this concept through the four steps you have learnt in the previous concepts.

### Step 1 The Question

What happens to objects when they collide with each other ?

### Step 2 My Hypothesis (Claim)

.....

.....

.....

### Step 3 My Evidence

.....

.....

.....

.....

### Step 4 My Scientific Explanation

.....

.....

.....

.....

.....

### Notes for parents

- Help your child to think like a scientist by answering a question about one of the main points of this concept, then write his/her hypothesis, evidence and scientific explanation.



- Look at the following pictures, then answer :



- In your opinion, would the back collision be more damage than a side collision between the two cars ?  Yes  No

### Crash investigator

Scientists use evidence to explain that an object in motion continues in motion until something stops it and crash investigators use these evidence to investigate reasons on car crashes.

- In this activity, we are going to study :
1. How does a crash investigator deal with collisions ?
  2. Crash investigator tasks.
  3. Crash site scenarios.

#### 1. How does a crash investigator deal with collisions ?

- A crash investigator sees a car crash as a puzzle, to solve this puzzle, he uses scientific laws of motion.
- A crash investigator must ask the drivers of the two cars to determine who caused the accident.
- A crash investigator gets a lot of information as a result of examining the two cars and he also finds out more information using what he knows about **force, energy and motion**.



- Help your child to learn more about crash investigator through some online sources.



## 2. Crash investigator tasks

### A Take measurements from the scene of the accident :

- He measures the damage that occurs to the cars and the distance that each car moves as a result of the crash.



- Sometimes, he uses photos and videos that provide him with the needed information of the crash scene instead of taking measurements at the scene directly in order to learn more about the crash without blocking the road.

- Crash investigators store the crashed cars to check their damages accurately.

### B Collecting data :

- A crash investigator needs to know the force that acted on a vehicle.

- He measures the mass of the vehicle using a scale.



Car manufacture

- He uses **reference materials** about the measurements of the cars that he can get from the cars manufacturers.

- Manufacturers crash each car under controlled conditions, where they put devices that measure the forces directly, so the damage to the vehicle changes with changing the force.

- He compares the cars from the crash to the data that the manufacturers supply, this comparison helps the crash investigator to know how much force acts on the crash.

### Notes for parents

- Discuss with your child how the crash investigator collects data about accidents.



### 3. Crash site scenarios

- The following diagrams were drawn from above for two cars **with equal masses** collide with each other from different directions :

#### 1. Side collision.

#### 2. Front collision.

##### 1 Side collision

- The red car moves in a straight line across the intersection from the stop position, while the blue car moves also in a straight line, so the blue car hits the red car **at its side**.
- The red arrow shows the direction of the red car after collision.

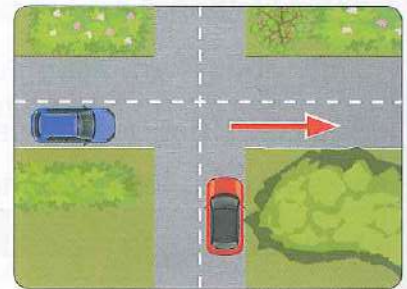


Diagram ①

##### 2 Front collision

- The red car moves through its right way slowly towards the intersection, while the blue car moves very fast in a wrong direction.
- The two cars meet each other and collide **from the front**.
- The red arrow shows the direction of the red car after collision.

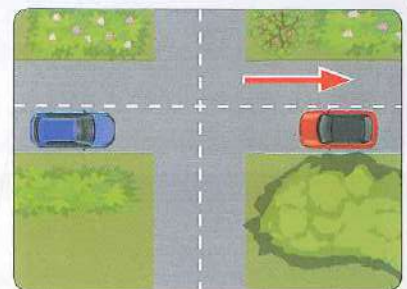


Diagram ②



### Check your understanding

#### ► Put (✓) or (✗) :

- Photos and videos provide crash investigator with information during car crashes. ( )
- Crash investigator needs to know the force acted on a vehicle during collision. ( )

#### In the Exercises Book :

##### Try to answer :

- Exercises on Lesson ⑥ p. 79
- Self-Assessment ②②
- Model Exam on Concept (2.4)

- Let your child answer the questions to check his/her understanding.



## Activity 12

# Review : Energy and Collisions

### ► We can summarize this concept in the following main points :

- When two objects collide with each other, an energy transfer occurs and also changes of energy occur.
- A faster and heavier (more mass) object has more energy, so it causes more damage than a slower and lighter (less mass) object.
- Safty equipment used during collision of cars are **seatbelts** and **airbags**.
- **Seatbelts** are used in cars to keep the driver's body and also the passengers from moving forward when the car stops suddenly.
- **Airbags** slow the speed of the driver moving forward and absorb the energy of the car due to its collision.

### Collision:

It is the moment where two objects hit or make contact in a forceful way.

- 
- By increasing the force, mass and speed of an object, its kinetic energy increases.
  - During collision, there are changes of kinetic energy may be in the form of heat, light or sound.
  - The speed and kinetic energy of a moving object on a ramp can be increased by :
    1. Increasing the angle of the ramp.
    2. Increasing the mass of the object.
- 
- Some of kinetic energy changes into other forms of energy such as sound energy and thermal energy in Newton's cradle.
- 
- Crash investigator tasks are :
    - Take measurements from the scene of the accident.
    - Collecting data.
  - Crash investigator uses photos and videos that provide him with the needed information of the crash scene.

### Notes for parents

- Help your child review the main points in this concept.



# UNIT TWO Project

## Vehicle Safety

► Read the following paragraph to learn some information about safety features in cars.

- Carmakers design vehicles for safety. The most common safety features in cars include seatbelts, airbags and headrests. Carmakers use new technologies to design new ways to keep drivers and passengers safe.
- When passengers travel in a car and it suddenly stops, the forward force of the car's motion continues to act on the passengers. Most of time, the seatbelts are used to hold the driver or the passengers in their places so that they do not hit the steering wheel, dashboard, front windshield of the car or any hard objects inside the car.
- Sometimes, the seatbelts are not enough to protect the passengers, so airbags have been added to many cars in the front of cars and also in the side doors to help protect the passengers during a collision or a sudden stop. These airbags are folded up inside the frame of the car and they work in the case of sudden change in direction or motion, or during collisions.



**Use printed or online sources to make a report about one of the new safety features in cars (other than airbags) that carmakers introduced in the last 10 years and create a plan to improve this device.**

**Your report should describe :**

- The name of the device you will choose.
- How your device works during collisions or dangers.
- Which passengers would benefit from your device (e.g. the driver, the front passenger or the back passengers).
- The methods you can use to test your device.
- How can you improve your device.

• Let your child create a report about one of the new safety devices in cars using different sources and also explain how does it work, how to test it and how to improve it.



**The name of my device :**

.....

**How my device works :**

.....  
.....  
.....  
.....  
.....  
.....

**Which passengers would benefit from my device :**

.....  
.....

**Methods to test my device :**

.....  
.....  
.....  
.....  
.....

**Improve my device :**

.....  
.....  
.....



# Glossary





**Concept 2.1**

Apply	يطبق
Average	متوسط
Balanced forces	قوى متزنة
Cart	عربة صغيرة
Continuous	متواصل / مستمر
Crash	تحطم
Deploy	ينتشر
Energy	طاقة
Engine	محرك
Engineer	مهندس
Exert	يبذل
Fire extinguisher	طفاية حريق
Force	قوة
Gravity	الجاذبية
Jet airplane	طائرة نفاثة
Launch	يطلق
Launch pad	منصة الإطلاق
Motion	حركة
Orbit	مدار
Parachute	مظلة / باراشوت
Pushing force	قوة دفع
Pulling force	قوة جذب
Rub	يدلك
Rocket	صاروخ
Roll	يلف
Require	يحتاج
Satellite	قمر صناعي
Speed	سرعة
Truck	شاحنة
Tug-of-war game	لعبة شد الحبل
Transfer	ينقل
Unbalanced forces	قوى غير متزنة
Vehicle	مركبة
Work	شغل

**Concept 2.2**

Ability	قدرة
Chemical energy	طاقة كيميائية
Classify	تصنيف

Convert / Transform	يتحول
Create	يخلق
Combustion	احتراق
Destroy	يفنى
Electricity	كهرباء
Electrical energy	طاقة كهربائية
Flip	يقلب
Gravitational energy	طاقة الجاذبية
Gasoline	بنزين
Hill	تل / هضبة
Kinetic energy	طاقة حركة
Mechanical energy	طاقة ميكانيكية
Olympic	أوليمبي
Potential energy	طاقة وضع
Particles	جزيئات
Roller coaster	قطار الملاهي
Robot	انسان آلي
Surfer	شخص متزلج
Slope / Ramp	منحدر
Store	يخزن
Spring wire	سلك زنبركي
Skating	تزلج
Thermal energy	طاقة حرارية
Vibration	اهتزاز
Waves	موجات

**Concept 2.3**

Rate	معدل / متوسط
Angle	زاوية
Basics	مبادئ
Cheetah	الفهد
Calculate	يحسب
Car brakes	فرامل السيارة
Climate	المناخ
Charging	شحن
Distance	مسافة
Exhaust	العادم
Electric vehicle	عربة كهربائية
Flexible	مرن
Gas pedal	دواسة الوقود
Highway	طريق سريع



Incline	المنحدر
Inclination	انحدار / ميل
Lightweight	خفيف الوزن
Measuring unit	وحدة قياس
Masking tape	شريط لاصق
Mechanical engineer	مهندس ميكانيكا
Oversize	ضخم
Predator	مفترس
Powerful	قوى
Resistance	مقاومة
Shoulder	كتف
Spine / Backbone	العمود الفقري
Scenario	سيناريو
Solar vehicle	عربة شمسية
Speedometer	عداد السرعة
Traffic jam	زحام مروري
Vehicle	عربة

## Concept 2.4

Airbag	وسادة هوائية
Accident	حادث
Bat	مضرب
Balance	ميزان
Collision	تصادم
Collide	يصطدم
Conversion	تحويل
Cricket	لعبة الكريكيت
Cushion	وسادة
Crash	تحطم
Clay	صلصال
Crash investigator	محقق التصادم
Car manufacturers	صانعي السيارات
Driver	سائق
Dashboard	لوحة عدادات السيارة
Deflate	يفرغ الهواء
Endanger	معرض للخطر
Examine	يفحص
Fold	مطوي
Forceful	قوى
Inflate	ينتفخ
Irregular	غير منتظم

Injuries	إصابات
Laws	قوانين
Mass	كتلة
Moment	لحظة
Marble	بلي
Nylon	النايلون
Newton's cradle	لعبة نيوتن
Popping sound	صوت فرقة
Passenger	راكب
Post	عمود
Suddenly	فجأة
Safety equipment	تجهيزات الأمان
Seatbelt	حزام الأمان
Steering wheel	عجلة القيادة
Sensors	حساسات
Severe	شديد / حاد
String	خيوط / وتر
Scene	مشهد
Traffic sign	علامة مرور
Tasks	مهام
Vents	ثقوب / فتحات
Wrecking ball	كرة التدمير
Wobble	يتردد / يهتز





EL-MOASSER

# SCIENCE

By a group of supervisors

Exercises Book

THEME

2

MATTER  
& ENERGY



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Primary  
2022

FIRST TERM

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# This Exercises Book

Includes Two parts

Part

1

## Exercises on Lessons

(Page 3)

**Includes :**

Variant questions on each lesson of concepts.



**Note**

All questions in this part are classified according to Bloom's taxonomy.



Part

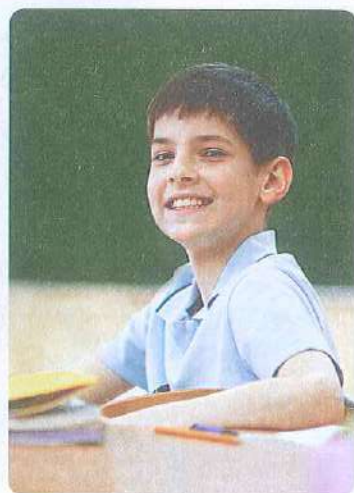
2

## Self-Assessments

(Page 82)

**Includes :**

- Cumulative self-assessments on lessons of each concept.
- A model exam on each concept.
- A model exam on Theme (2).



Part

3

## Final Examinations

(Page 122 )

**Includes :**

- Models of final examinations on the first term.

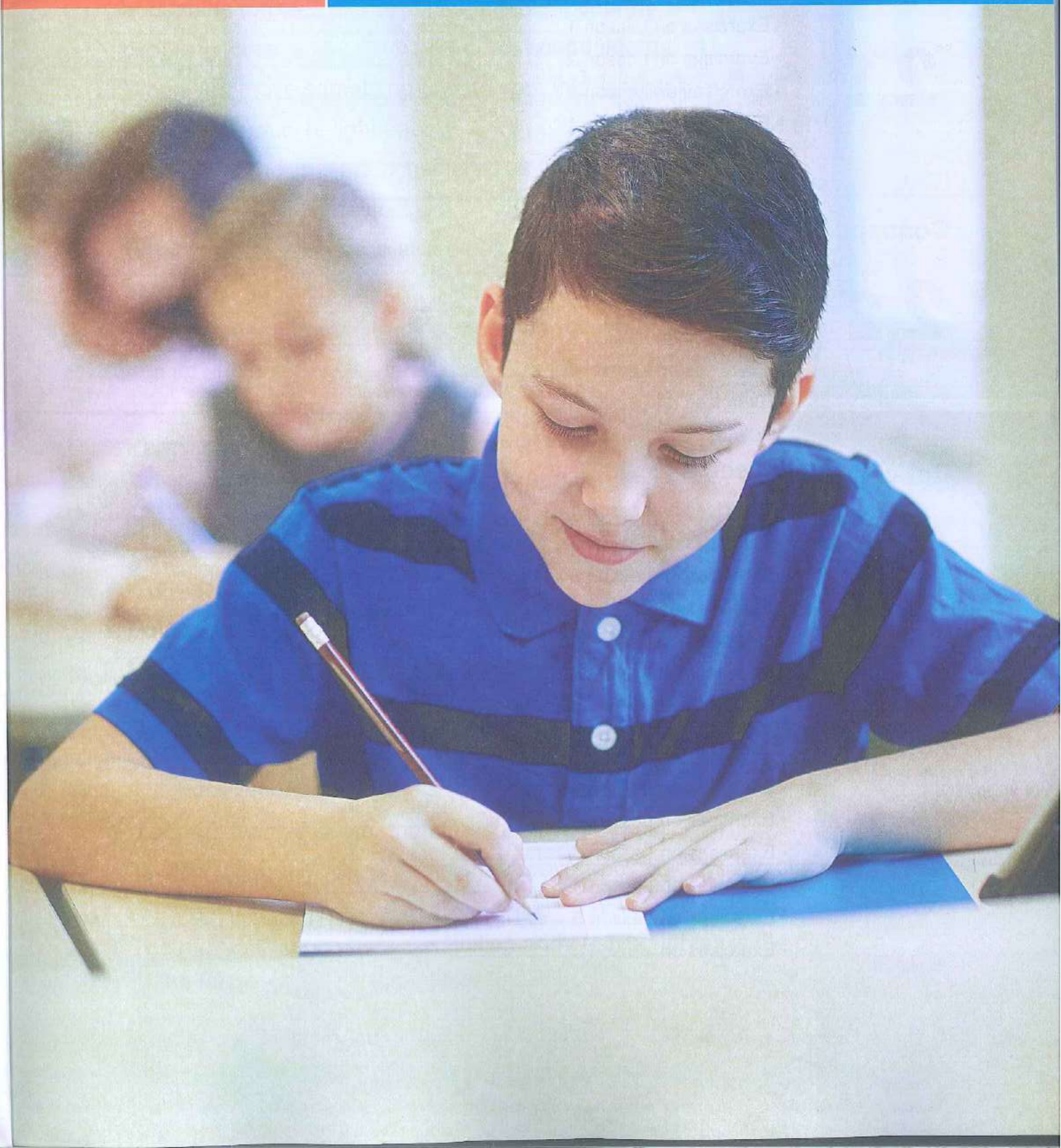




Part

1

# Exercises on Lessons





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## UNIT TWO : Motion

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Concept

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Concept

**2.4**

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**3 Write the scientific term of each of the following :**

- 1. A force that you make to change the direction of an object towards you. (.....)
- 2. A force that you make to change the direction of an object away from you. (.....)
- 3. One of the fastest and most powerful trucks in the world. (.....)

**4 Complete the following sentences :**

- 1. The car can move or stop depending on the change of ..... acting on it.
- 2. When we put a jet engine in a normal truck, its speed will .....
- 3. In the shockwave truck, engineers put three ..... engines in it to increase its speed, and they installed three ..... to stop it.
- 4. The idea of stopping the shockwave truck is the same idea of stopping a moving .....
- 5. The shockwave truck starts to move by the ..... engines and starts to ..... by the help of parachutes.
- 6. Engineers use parachutes to slow down the motion of the ..... truck and ..... to stop them.
- 7. When you kick the ball that standing on land, it starts to .....

**5 Give reasons for :**

- 1. The shockwave truck is faster than the normal truck.

.....  
 .....

- 2. Engineers use parachutes in the shockwave truck designs.

.....  
 .....

**6 What happens if ... ?**

- 1. Engineers placed jet engines inside a normal truck instead of its normal engine.

.....

- 2. The shockwave driver opens the parachutes.

.....

- 3. You kick a stopped ball on the ground.

.....



**7** Classify the following actions in the table below according to the needed force :

1. Typing on a keyboard.
2. Lifting a bag.
3. Moving a chair away from you.
4. Kicking a football.
5. Closing your room's door from inside the room.
6. Opening the door of a refrigerator.

Pulling force	Pushing force
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

**8** Look at the following figures, then complete the following sentences :



Normal truck  
Figure (1)



Jet airplane  
Figure (2)

1. The engine of figure (.....) is much powerful than the engine of figure (.....).
2. When the engines of figure (.....) are placed in the figure (.....) it will turn into the shockwave truck.
3. The engines that are used in figure (.....) is the same engines that are used in the shockwave truck.

**9** Look at the opposite figure, then complete the following sentences :

1. The person in this figure use ..... to land safely.
2. The idea of person landing in this figure is the same idea of stopping the motion of ..... and .....





**Exercises on Lesson 2****1 Choose the correct answer :**

- 1. All objects around us can move by the effect of .....
  - a. pushing force only.
  - b. pulling force only.
  - c. pushing and pulling forces.
  - d. sound and light energies.
- 2. A ball may move away from the foot of a football player by the effect of .....
  - a. pushing force only.
  - b. pulling force only.
  - c. pushing and pulling forces.
  - d. sound energy only.
- 3. By increasing the number of fire extinguishers fixed to a cart, .....
  - a. its speed increases.
  - b. its speed decreases.
  - c. its speed doesn't change.
  - d. its speed becomes zero.
- 4. In the tug-of-war game, two teams .....
  - a. pull the rope in the same direction.
  - b. pull the rope in opposite directions.
  - c. push the rope in the same direction.
  - d. push the rope in opposite directions.
- 5. In the tug-of-war game, when two teams are pulling a rope, and the rope does not move towards any team, this means that .....
  - a. equal forces are being applied on the rope in the same direction.
  - b. equal forces are being applied on the rope in opposite directions.
  - c. unequal forces are being applied on the rope in the same direction.
  - d. unequal forces are being applied on the rope in opposite directions.
- 6. Which of the following is an example of unbalanced forces ? .....
  - a. Two persons pushing a box with the same force in opposite directions.
  - b. Two children play on a seasaw without its moving up or down.
  - c. Two children play on a seasaw, while it moves up and down.
  - d. Two teams play the tug-of-war game, while the rope doesn't move.
- 7. When an object is in motion, this means that its ..... changes.
  - a. color
  - b. shape
  - c. size
  - d. position
- 8. All of the following are examples of motion except .....
  - a. a running person.
  - b. a ball travelling through the air.
  - c. a flying bird.
  - d. a sleeping dog.







- 4. To move anything from one place to another, you need to ..... it or ..... it.
- 5. In the tug-of-war, the ..... force makes the rope moves toward the stronger team.
- 6. If the pushing force on an object is equal to another pushing force in the opposite direction, this means that the forces are ..... and the object will not move.
- 7. You can stop the basketball by the ..... force of your hand against the ball.
- 8. The train's position changes relative to the train station. This sentence describes the meaning of .....
- 9. The chair stands on the floor due to the pulling force of .....
- 10. Although the Earth is in a continuous ....., we cannot see it.
- 11. If you throw a ball through the air, it is affected by the ..... force of your hand and the ..... force of the Earth's gravity.
- 12. We can say that the object is in motion relative to a ..... point.

### 5 Correct the underlined words :

- 1. By increasing the speed of a moving cart, the distance that it moves will decrease. (.....)
- 2. Moving an object away from you represents a pulling force. (.....)
- 3. Moving an object towards you represents a pushing force. (.....)
- 4. The balanced forces cause the object to move. (.....)
- 5. Keeping the position of an object relative to a fixed point represents motion. (.....)

### 6 Give reasons for :

- 1. When you kick a ball that laying on the ground, it moves.  
.....
- 2. When two equal pushing forces act on an object in opposite directions, the object doesn't move.  
.....
- 3. If you let a pen out of your hand, it falls on the ground.  
.....
- 4. When your friend catches a ball that is thrown in the air, the motion of the ball is stopped.  
.....



**7** What happens if the pulling forces of the two teams are equal in the tug-of-war game ?

.....  
 .....

**8** Look at the opposite figure, then answer the following questions :



1. In the opposite figure what happens if we increase the number of fire extinguishers fixed on the cart.

.....  
 .....

2. Put (✓) or (X) :

- 1. The air released by fire extinguishers moves backward, so the cart moves forward. ( )
- 2. When we decrease the number of fire extinguishers, the cart moves for a longer distance. ( )

**9** Write the type of force that is used in each of the following situations :



1. ....



2. ....



3. ....



4. ....

**10** Mention one example of pushing force and another one example of pulling force from your daily life :

- 1. Pushing force : .....
- 2. Pulling force : .....



## Exercises on Lesson

3

## 1 Choose the correct answer :

1. All the following are examples of acting forces except .....
  - a. kicking a ball.
  - b. pressing a button.
  - c. listening to music.
  - d. lifting up a bag.
2. When you sit on a chair, the force of gravity is ..... and holding you in the chair.
  - a. pulling you upward
  - b. pulling you downward
  - c. pushing you upward
  - d. pushing you downward
3. What is the name of the force that makes a ball in the air fall down to the ground ? .....
  - a. Friction.
  - b. Gravity.
  - c. Sound.
  - d. Light.
4. Which of the following will cause an object to move ? .....
  - a. Balanced forces.
  - b. Unbalanced forces.
  - c. Sound energy.
  - d. Light energy.
5. Two equal forces act at the same time on a stopped object but in opposite directions. Which sentence describes the object's motion ? .....
  - a. The object's speed increases.
  - b. The object's speed decreases.
  - c. The object's speed doesn't change.
  - d. The object remains stop.
6. The force that tries to stop an object moving on a surface is called .....
  - a. gravity.
  - b. friction.
  - c. push.
  - d. pull.
7. There is a ..... force between the car's tires and the road that decreases its speed gradually.
  - a. gravity
  - b. friction
  - c. push
  - d. pull
8. Which of the following sentences describes the friction force ? .....
  - a. It pulls objects toward the ground.
  - b. It pushes objects away from the ground.
  - c. It slows down or stops objects in motion.
  - d. It doesn't affect objects in motion.



**2 Put (✓) or (X) :**

- 1. Unbalanced forces cause a change in the object's motion. ( )
- 2. When a car crashes into a wall, it will not stop. ( )
- 3. Sometimes it is easy to observe the force that stops an object. ( )
- 4. When a car runs out of fuel on a flat road, its speed increases gradually until it stops. ( )
- 5. Friction force always slows down or stops the motion of moving objects. ( )
- 6. Friction force slows down the motion of a satellite in the space. ( )
- 7. Unbalanced forces keep an object in its place without moving. ( )

**3 Correct the underlined words :**

- 1. When you jump up, the force of friction pulls you back to the ground. (.....)
- 2. The rope in the tug-of-war game may not move towards any team, if both teams push with the same force. (.....)
- 3. Moving objects stop when a force of the same amount is applied to it in the same direction. (.....)
- 4. If the car runs out of fuel, its speed increases. (.....)
- 5. The motion of a car is opposed by the gravity of air. (.....)

**4 Write the scientific term of each of the following :**

- 1. It is a push or pull that is applied to an object causes it to change its position. (.....)
- 2. It is a force that is exerted when objects rub against each other. (.....)
- 3. It is a force that slows down the motion of moving objects. (.....)
- 4. A man-made object that is launched into orbit in the space using a rocket. (.....)

**5 Complete the following sentences :**

- 1. When you sit down on a chair, there are two forces that applied to you which are the ..... force of gravity and the ..... force of the chair.
- 2. The toy placed on a table does not move due to the effect of the two ..... forces acting on it.
- 3. When you lift up an object from the ground, there are two forces act on it, which are the ..... force of your hand and ..... force of the gravity.
- 4. The speed of a moving ball on the ground decreases gradually until it stops due to the effect of ..... force.



- 5. Any body moves when pushing force or ..... force is larger than the ..... force.
- 6. When you throw a ball up in the air, it starts to fall down again towards the ground due to the effect of pulling force of .....
- 7. A moving car is affected by the ..... force of both air and road which act in the ..... direction of the car movement.

**6 Give reasons for :**

- 1. When your toy car crashes into a wall it will stop moving.  
.....  
.....
- 2. If you push a pen on the table, it moves for a certain distance till it stops.  
.....  
.....
- 3. When you stop pedalling during the movement of your bicycle, it slows down until its stops.  
.....  
.....
- 4. A satellite can keep travelling in space at the same speed for hundreds of years.  
.....  
.....

**7 What happens if ... ?**

- 1. You let your toy out of your hand.  
.....  
.....
- 2. You kick a football with your leg.  
.....  
.....
- 3. An object moves with a certain speed in the space.  
.....  
.....



**8** Look at the following figure, then choose the correct answer :



- The forces that act on the basketball in this figure are .....
  - pushing force of both gravity and the player's hand.
  - pulling force of both gravity and the player's hand.
  - pushing force of gravity and pulling force of the player's hand.
  - pulling force of gravity and pushing force of the player's hand.
- The basketball will fall down on the ground due to the ..... that acts on it.
  - pushing force of gravity
  - pulling force of gravity
  - friction force of air
  - friction force of ground

**9** Look at the following pictures, then choose if the forces are "balanced" or "unbalanced" :



1. Launching a rocket



2. A book on a table



3. A seesaw

**(Balanced – Unbalanced) (Balanced – Unbalanced) (Balanced – Unbalanced)**



## Exercises on Lesson

4

## 1 Choose the correct answer :

- 1. Mona throws her ball up in the air so, gravity will make her ball .....
  - a. move forward.
  - b. move upward.
  - c. move downward.
  - d. stop in the air.
- 2. Tamer pushes a ball on a flat ground and it covers a distance of 30 cm. If he pushes it with more force, it may cover a distance equal to ..... cm.
  - a. 5
  - b. 15
  - c. 30
  - d. 50
- 3. The force that occurs when an object rubs against another object is called .....
  - a. friction.
  - b. gravity.
  - c. push.
  - d. pull.
- 4. Which sentence represents the best example of gravity ? .....
  - a. A car hits a tree, and its motion stops.
  - b. A wind blows, and a sailboat moves.
  - c. A book is pushed, and it moves across a table.
  - d. A person drops ball, and it falls to the ground.
- 5. If your father and your young brother take turns pushing you on the swing, the hand pushing force of your father will be .....
  - a. less than that of your brother.
  - b. the same as that of your brother.
  - c. more than that of your brother.
  - d. weaker than that of your brother.
- 6. When we throw a ball into the air, it falls downward. During its falling it is affected by two forces which are .....
  - a. friction of air and push.
  - b. push and pull.
  - c. push and gravity.
  - d. friction of air and gravity.

## 2 Put (✓) or (X) :

- 1. The motion of an object is affected by a friction force. ( )
- 2. Gravity pulls objects upward. ( )
- 3. Hard push causes an object to travel for a longer distance. ( )
- 4. If the same force acts on two different objects so, the bigger object will travel for a longer distance. ( )
- 5. A football rolls on the ground to a distance then it stops. The force which stops the ball is the gravitational force. ( )



**3 Complete the following sentences :**

- 1. When you push a ball hard by your leg it will move for a ..... distance, but when you push the same ball gently by your leg it will move for a ..... distance.
- 2. We can say that a train is faster than a car if the ..... acting on the train is ..... than that acting on the car to move the same distance.
- 3. If you push a small ball and a big ball with the same force, the small ball moves a distance ..... than the big ball.
- 4. In tug-of-war game, the rope moves toward the group which has pulling force ..... than the other group.
- 5. If the same pulling force acts on two boxes, and one of them is larger than the other, the smaller box will move for a ..... distance.

**4 Give reasons for :**

- 1. If you push two similar toy cars, one of them may travel for a longer distance than the other.

.....  
 .....

- 2. If the same force acts on a small car and a truck, the small car will travel for a longer distance than the truck.

.....  
 .....

**5 What happens if you push two similar balls with different forces on the ground ?**

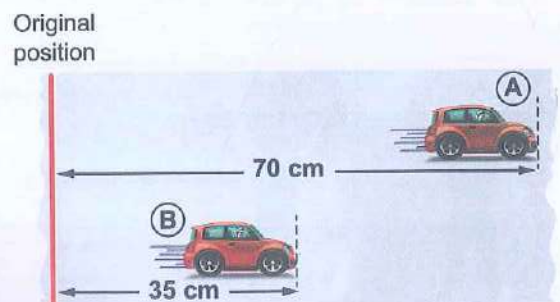
.....  
 .....

**6 The following figure shows two similar toy cars, study the figure then answer the questions below :**

- 1. Which of these two cars is affected by a greater force ?

(Give a reason for your answer).

.....  
 .....





**2. Choose the correct answer :**

1. If the two cars are affected with the same force, so .....
  - a. car (A) will move for a longer distance than car (B).
  - b. car (B) will move for a longer distance than car (A).
  - c. the two cars will move to the same distance.
  - d. the two cars will not move.
2. If you replace car (A) with a new car which is larger than that of car (B), so the new car will move for a distance ..... the distance covered by car (B).
  - a. longer than
  - b. shorter than
  - c. equal to
  - d. twice
3. The motion of the two cars are affected by all the following forces except .....
  - a. the pushing force.
  - b. the friction force of the air.
  - c. the friction force of the road.
  - d. the pushing gravity force.



## Exercises on Lesson 5

### 1 Choose the correct answer :

- 1. All of the following examples can move by a pushing force except .....
  - a. a ball. b. a swing.
  - c. tug-of-war game. d. a car.
- 2. To stop a moving object we can apply a ..... against it.
  - a. pushing force b. gravity force c. sound energy d. light energy
- 3. Samir pushed his toy car and it moved forward, to stop it he must .....
  - a. push it in the same moving direction.
  - b. pull it with a small force in the same moving direction.
  - c. pull it with a large force in the same moving direction.
  - d. push it in a direction opposite to its moving direction.
- 4. The work done is equal to the amount of ..... transferred by a force that is used to move an object.
  - a. energy b. friction c. pushing d. gravity

### 2 Put (✓) or (x) :

- 1. If a person moves a table through a distance so, there is a work done. (    )
- 2. Lifting a book upward needs more energy than pushing a truck. (    )
- 3. If you try to open a door, but you cannot open it. This means that a work is done. (    )
- 4. Hitting a tennis ball needs a pulling force. (    )

### 3 Complete the following sentences :

- 1. When you push a table on the floor, the ..... transfers from your body to the table.
- 2. Any force applied to an object considered as the effect that changes ..... and turns it into ..... done by this object.
- 3. The work done by a basketball is equal to the amount of ..... transferred from the player hand to the ball.
- 4. To stop the rolling ball on the ground, you need to do work ..... than the work done by the ball.

### 4 In the opposite figure, which of the two players does more work to raise the weights ? (Give a reason for your answer ).

.....

.....





# Exercises

## on Lessons of Concept (2.2)

● Understand

● Apply

● Analyze

● Evaluate

● Create

### Exercises on Lesson 1

#### 1 Choose the correct answer :

1. When a surfer moves down the hill, this means that he has a ....., due to his movement.
  - a. kinetic energy
  - b. stored light energy
  - c. potential energy
  - d. stored electric energy
2. The speed of the roller coaster when it goes up, .....
  - a. is equal its speed when it goes down.
  - b. is less than its speed when it goes down.
  - c. is more than its speed when it goes down.
  - d. increases as it doesn't need electricity.
3. When wheelchair and a car go up a ramp, .....
  - a. the wheelchair only can store some energy.
  - b. the car only can store some energy.
  - c. both of them can store some energy.
  - d. both of them cannot store any energy.
4. Electric motor in the roller coaster allows it to .....
  - a. move up to the top of the hill.
  - b. move down to the bottom of the hill.
  - c. stop at the top of the hill.
  - d. stop at the bottom of the hill.
5. When an object moves down a ramp, its stored energy .....
  - a. increases.
  - b. doesn't change.
  - c. changes to a less active form of energy.
  - d. changes to a more active form of energy.
6. The roller coaster has the most energy of motion, .....
  - a. when it goes up to the top of the hill.
  - b. when it goes down along the hill.
  - c. when it stopes at the top of the hill.
  - d. when it stops at the bottom of the hill.
7. When the roller coaster stops, its energy of motion .....
  - a. doesn't change.
  - b. increases.
  - c. decreases.
  - d. becomes zero.



- 8. When a car moves up a ramp, this happens due to the effect of .....
  - a. gravity force.
  - b. balanced force.
  - c. kinetic energy.
  - d. sound energy.

**2 Choose from column (B) what suits it in column (A) :**

(A)	(B)
1. When a wheelchair goes down a ramp,	a. it is under the effect of balanced force, and doesn't store energy.
2. When a wheelchair stops at the top of a ramp,	b. it has only energy of motion.
3. When a wheelchair stops at the bottom of a ramp,	c. it is under the effect of unbalanced force, where it losses its stored energy.
	d. it is under the effect of balanced force, and it stores energy.

1. ....

2. ....

3. ....

**3 Put (✓) or (X) :**

- 1. When a moving object is affected by two opposite equal forces it will stop. ( )
- 2. If a wheelchair moves horizontally on the ground, its energy of motion equals zero. ( )
- 3. The moving objects only have energy, while the objects that don't move have no energy. ( )
- 4. The electric lamp gives out two types of energies which are light energy and thermal energy. ( )
- 5. Radio is operated by sound energy, and produces electric energy. ( )
- 6. Clocks, cell phones and matches all work by batteries. ( )

**4 Write the scientific term of each of the following :**

- 1. The form of energy that the object has due to its movement. (.....)
- 2. The form of energy that increases when the speed of an object increases. (.....)
- 3. The form of energy that is produced from a radio. (.....)
- 4. The form of energy that is produced from an electric heater. (.....)
- 5. The form of energy that is stored in batteries. (.....)
- 6. The energy that is used to operate television. (.....)
- 7. The energy that is produced from electric fan. (.....)



**5 Correct the underlined words :**

1. When a roller coaster moves down a ramp, its kinetic energy doesn't changed. (.....)
2. A television produces light energy only. (.....)
3. If you push a pencil upward, it stopes at a certain hight then falls down due to the effect of pushing force of gravity. (.....)
4. When an object moves down, it has more active form of energy known as potential energy. (.....)
5. Under the effect of pushing force of gravity, anything falls down to the ground. (.....)
6. Balanced forces causing objects to move. (.....)

**6 Complete the following sentences :**

1. When the roller coaster starts to move it gets energy from .....found in its beginning car which is operated by .....
2. The speed of a roller coaster when it moves toward the top of the hill is ..... than that when it moves down the ramp.
3. If the speed of an object decreases this means that its kinetic energy .....
4. When the roller coaster moves up to the top of the hill, ..... and ..... energies cause its motion.
5. Fans produce ..... energy, while a match produces ..... energy.
6. Electrical energy is found in anything powered by ..... such as ..... and .....
7. Electric lamps give out ..... and ..... energies, while alarm bells produce ..... energy.
8. Chemical energy is stored in ..... and ..... , while ..... energy is used to operate computers.
9. Television works by ..... energy and it produces ..... and ..... energies.
10. Match and ..... produce thermal energy, this means that they give off .....

**7 Give reasons for :**

1. The roller coaster doesn't need electricity during its movement down the hill.

.....  
 .....



- 2. The speed of the roller coaster increases as it moves down the hill.

.....  
 .....

- 3. Both the Sun and electric lamp produce two forms of energy.

.....

### 8 What happens if ... ?

- 1. Roller coaster moves down the hill. (according to energy).

.....  
 .....

- 2. The roller coaster loses its kinetic energy.

.....

- 3. If a stopped ball at the top of a slope starts to move down. (according to its energy).

.....

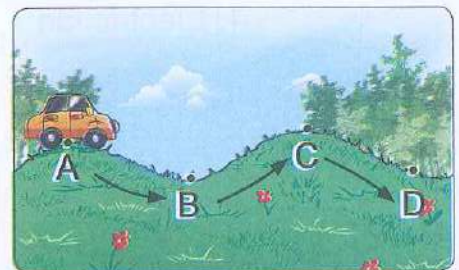
### 9 Cross out the odd word :

- 1. Guitar – Flashlight – Radio – Alarm bell. (.....)
- 2. The Sun – Electric heater – Match – Radio. (.....)
- 3. Electric mixer – Electric fan – Washing machine – Alarm bell. (.....)

### 10 Look at the following figure, then choose the correct answer :

- 1. The speed of the car increases when it .....

- a. stops at point (A).
- b. moves from (A) to (B).
- c. stops at point (C).
- d. moves from (B) to (C).



- 2. The speed of the car decreases when .....

- a. it moves from (A) to (B).
- b. its kinetic energy doesn't change.
- c. its kinetic energy increases.
- d. it moves from (B) to (C).

- 3. The kinetic energy of the car increases in all the following cases except when the car .....

- a. moves from (A) to (B).
- b. moves from (C) to (D).
- c. moves from (B) to (C).
- d. speed increases.



**11** You have four objects A, B, C & D if you know that :

- Object (A) can't move but can produce sound.
- Object (B) is an apple.
- Object (C) produces light and thermal energies.
- Object (D) doesn't produce light energy.

**Choose the correct answer :**

1. Object (A) may be .....

- a. electric lamp.    b. radio.    c. food.    d. flashlight.

2. Object (B) stores ..... energy.

- a. mechanical    b. thermal    c. chemical    d. light

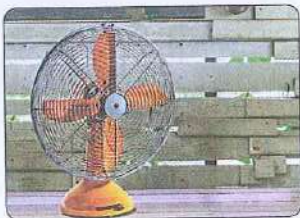
3. Object (C) may be .....

- a. alarm bell.    b. radio.    c. food.    d. the Sun.

4. Object (D) may be .....

- a. the moon.    b. the Sun.    c. flashlight.    d. electric lamp.

**12** Write the type of the produced energy below each of the following pictures :



1. Electric fan

.....



2. Alarm bell

.....



3. Electric mixer

.....



4. Radio

.....



5. Washing machine

.....



6. Bicycle

.....



**Exercises on Lesson 2****1 Choose the correct answer :**

- 1. Human needs ..... to walk from one place to another.
  - a. light energy
  - b. energy obtained from food
  - c. sound energy
  - d. energy obtained from batteries
- 2. Electric energy operates all the following devices, except .....
- a. radio.      b. candle.      c. cell phone.      d. television.
- 3. All the following examples produce thermal and light energies, except ..... that reflects light energy.
  - a. the Sun      b. electric lamp      c. the Moon      d. fire
- 4. When you throw a stone in a water lake, the ..... is transferred from the stone to the water surface.
  - a. potential energy
  - b. pulling force
  - c. gravity force
  - d. kinetic energy
- 5. A stopped object is placed at 10 meters height from the Earth's surface has ..... than the same object when placed at 5 meters height.
  - a. smaller potential energy
  - b. larger potential energy
  - c. smaller kinetic energy
  - d. larger kinetic energy
- 6. When a ball on a certain height is left to fall down, .....
- a. its kinetic energy is changed into potential energy.
- b. its potential energy is changed into kinetic energy.
- c. its potential energy remains as it is.
- d. its kinetic energy remains as it is.
- 7. All the following energies cannot be seen, except .....
- a. thermal energy.      b. electric energy.
- c. light energy.      d. sound energy.
- 8. The energy that is stored in an object due to its position, is known as .....
- a. kinetic energy.      b. potential energy.
- c. electric energy.      d. chemical energy.



- 2** The following table shows Samy in different situations. Choose from column (B) the type and the amount of energy that suits each situation in column (A) :

(A)	(B)
1. Samy stops at a 20 meter height.	a. he has a stored electrical energy.
2. Samy stops at a 5 meter height.	b. he does not have potential or kinetic energies.
3. Samy stops on the Earth's surface.	c. he has a large amount of kinetic energy.
4. Samy walks slowly on the Earth's surface.	d. he has a small amount of potential energy.
5. Samy runs fast on the Earth's surface.	e. he has a small amount of kinetic energy.
	f. he has a large amount of potential energy.

1. ....

2. ....

3. ....

4. ....

5. ....

- 3** Put (✓) or (X) :

1. We eat food to obtain electric energy. ( )
2. The energy used in cooking is known as sound energy. ( )
3. All electric devices are operated by using electric energy. ( )
4. Energy don't transfer from an object to another. ( )
5. Any moving object stores energy known as kinetic energy. ( )
6. When a stopped object is left to fall down to the Earth's surface, its potential energy is changed into kinetic energy. ( )
7. We cannot see all forms of energy, except electrical energy. ( )
8. We can measure the distance that an object moved, as a result of pushing force. ( )
9. To do work, you must push or pull an object to a certain distance. ( )
10. As the height of an object from the Earth's surface increases, its potential energy decreases. ( )
11. When an object moves faster, it gains larger amount of kinetic energy. ( )

- 4** Write the scientific term of each of the following :

1. The energy that is used in operating all electric devices. (.....)
2. The energy that reaches our ears, causing hearing. (.....)



- 3. The energy that is stored in an object, due to its position at a certain height from the Earth's surface. (.....)
- 4. The energy that the object gains due to its motion. (.....)
- 5. The ability to do work or cause change. (.....)
- 6. The force that makes an object to move over a distance. (.....)
- 7. The energy that is changed into kinetic energy, when an object falls down to the Earth's surface. (.....)

### 5 Correct the underlined words :

- 1. Sound energy is used in cooking food. (.....)
- 2. Your potential energy is transferred from your foot to a ball, when you kick it. (.....)
- 3. The ability to do force or cause change, is known as energy. (.....)
- 4. We cannot see all forms of energy, except thermal energy. (.....)
- 5. As the object moves faster, its potential energy increases. (.....)
- 6. The energy form that presents in a stopped wooden box placed on a table, is kinetic energy. (.....)

### 6 Complete the following sentences :

- 1. If you have the ability to push a chair, so you have .....
- 2. When a ball moves over a distance it needs a force that is known as .....
- 3. When you kick a ball, the ..... energy of your foot transfers to it, so it moves through the air.
- 4. When an apple falls from a tree its ..... energy will decrease, while when a rocket goes up its potential energy will .....
- 5. Some types of energy can be seen such as ..... energy, while some other types of energy can't be seen such as ..... and ..... energies.
- 6. Any object will move, if it has ..... energy.
- 7. If an object is placed at a height of the Earth's surface, it will store ..... energy.
- 8. If a bird flies up from the ground to a high tree, so its potential energy will .....
- 9. If you move a bag placed on a table to the floor, its potential energy will .....

### 7 Give reasons for :

- 1. The goal net vibrates when a ball hits it.
- .....



- 2. An apple on the tree has energy.

.....  
 .....

- 3. When a stone is thrown upwards, its potential energy increases.

.....

### 8 What happens if ... ?

1. An object is placed at a height from the Earth's surface.

(according to its potential energy).

.....  
 .....

2. An apple falls from a tree to the ground. (according to the change in its energy).

.....  
 .....

3. You transfer a book from a lower shelf to a higher shelf.

(according to its potential energy).

.....  
 .....

### 9 Look at the opposite figures, then choose the correct answer :

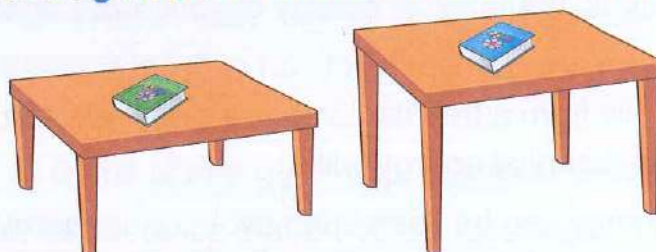


Table (a)

Table (b)

1. According to the potential energy, which of the following statements is correct ? .....
  - a. The two books have the same potential energy.
  - b. The book on table (a) has potential energy more than that on table (b).
  - c. The book on table (b) has potential energy more than that on table (a).
  - d. The two books have no potential energy.
2. If you transfer the book on table (a) and place it on table (b), so its potential energy .....
 

a. increases.	b. decreases.
c. doesn't change.	d. decreases then increases.



**10** Look at the two opposite figures, then choose the correct answer :

- In figure (a), the acrobat (1) has .....
  - potential energy more than that of acrobat (2).
  - potential energy less than that of acrobat (2).
  - potential energy similar to that of acrobat (2).
  - no potential energy like acrobat (2).
- In figure (b), during the rising up of the acrobat (2) into the air, his .....
  - potential energy decreases.
  - potential energy increases.
  - potential and kinetic energies increase.
  - potential and kinetic energies decrease.

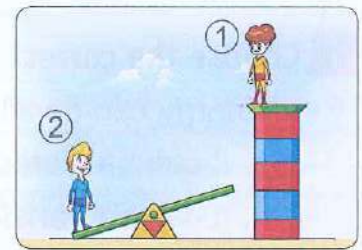


Figure (a)

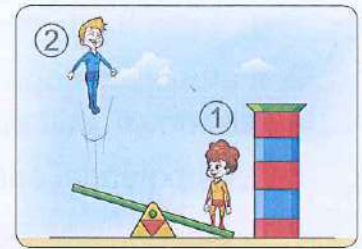
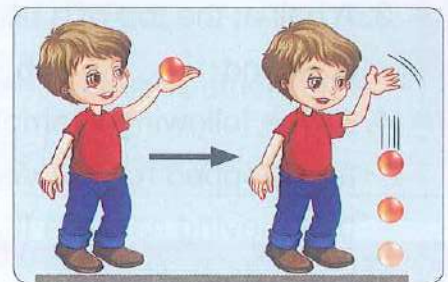


Figure (b)

**11** Look at the opposite figure, then complete the following sentences :

- When the boy lets the ball falls down, the ..... energy which is stored in the ball changes into ..... energy.
- When the ball hits the floor and bounces up, so its ..... energy will increase while it rises up.





**Exercises on Lesson 3****1 Choose the correct answer :**

- 1. Energy can do all the following, except .....
  - a. It can be stored in an object.
  - b. It can be transferred from an object to another one.
  - c. It can be transformed from one form into another one.
  - d. It can be destroyed and cannot be created.
- 2. If an object stops at a certain height from the Earth's surface for two hours then falls down, this means that .....
  - a. its potential energy will be destroyed before two hours.
  - b. its kinetic energy will be destroyed after two hours.
  - c. its stored potential energy will change into kinetic energy.
  - d. its stored kinetic energy will change into potential energy.
- 3. A ball at the top of a hill stores ..... energy.
  - a. sound
  - b. light
  - c. chemical
  - d. potential
- 4. All the following examples have stored potential energy, except .....
  - a. a stopped roller coaster at the top of a hill.
  - b. a moving car on a flat road.
  - c. a battery of a car.
  - d. a compressed spring of a toy.
- 5. All the following examples represent kinetic energy, except .....
  - a. light waves moving through the air.
  - b. sound waves moving through the air.
  - c. stored chemical energy in a car battery.
  - d. water particles movement during heating.
- 6. The potential energy of an object, depends on .....
  - a. its mass only.
  - b. its height from the Earth's surface only.
  - c. its mass and its height from the Earth's surface.
  - d. its temperature.
- 7. All types of energy can be classified into two main groups which are .....
  - a. light energy and sound energy.
  - b. chemical energy and electrical energy.
  - c. potential energy and kinetic energy.
  - d. magnetic energy and thermal energy.



- 8. The stored energy in a battery of a flashlight changes into ..... , when it is turned on.
  - a. chemical energy
  - b. sound energy
  - c. light energy
  - d. potential energy
- 9. All the following examples store chemical energy, except .....
  - a. food.
  - b. natural gas.
  - c. a battery.
  - d. a compressed spring.

**2 Choose from column (B) what suits it in column (A) :**

(A)	(B)
1. Sound energy.	a. it changes into another energy that can be stored inside the human body.
2. Light energy.	b. when it reaches our ears, it causes hearing.
3. Thermal energy.	c. it changes into electrical energy in a flashlight.
4. Stored chemical energy in food.	d. it is produced from electric heater.
5. Stored chemical energy in a battery.	e. when it reaches the nose, it causes smelling.
	f. when it reaches our eyes, it causes vision.

1. .... 2. .... 3. .... 4. .... 5. ....

**3 Put (✓) or (x) :**

- 1. New energy cannot be created, but existing energy can be destroyed. ( )
- 2. A compressed spring stores potential energy, until it is released in the form of more active energy. ( )
- 3. Objects that have the same masses and placed at the same heights, must have the same potential energy. ( )
- 4. Kinetic energy cannot be transformed into potential energy. ( )
- 5. Light waves is a form of potential energy. ( )
- 6. We can see the movement of electricity through a wire. ( )
- 7. You can change kinetic energy into stored potential energy, when you compress a toy spring. ( )
- 8. As the height of an object from the Earth's surface increases, its potential energy increases. ( )

**4 Write the scientific term of each of the following :**

- 1. It is the energy stored in an object due to its position. (.....)
- 2. It is the stored potential energy in a battery of a car. (.....)



- 3. It is a form of kinetic energy that can move through the air and we can see it. (.....)
- 4. It is a form of kinetic energy that resulted from vibrations of particles in a substance as it heats up. (.....)
- 5. It is a form of potential energy that pulls objects towards the Earth's surface. (.....)
- 6. It is the stored potential energy in a compressed spring. (.....)

### 5 Correct the underlined words :

1. When an object falls from a certain height, its stored potential energy changes into chemical energy. (.....)
2. The energy that is resulted due to the vibration of particles in a substance as it heats up, known as sound energy. (.....)
3. As the height of an object decreases from the Earth's surface, its potential energy increases. (.....)
4. Thermal, chemical, electrical and light energies are forms of kinetic energy. (.....)
5. A car battery stores a form of kinetic energy known as chemical energy. (.....)
6. A fan turns the chemical energy stored in natural gas into thermal energy. (.....)

### 6 Complete the following sentences :

- 1. Among the forms of potential energy ..... and ..... energies, while ..... energy is a form of kinetic energy.
- 2. The energy which is stored in a ball at the top of a hill is ..... potential energy, while ..... potential energy is stored in a compressed spring.
- 3. The vibration of particles in a substance such as water during heating is ..... energy which is considered as one of the forms of ..... energy.
- 4. Some forms of kinetic energy move in air in the form of waves such as ..... and ..... energies.
- 5. Electrical energy is changed in loudspeakers into ..... energy, while it is changed in electric fan into ..... energy.
- 6. In the electric bell, ..... energy changes into ..... energy.
- 7. The chemical energy in the battery of a flashlight can be changed into ..... and ..... energies.



- 8. In gas oven, ..... energy changes into ..... energy.
- 9. When a ball is found on a table it stores ..... energy, while as it falls down to the ground, this energy changes into ..... energy.
- 10. When you clap your hand, the kinetic energy changes into ..... energy, while when you rub your hands together, kinetic energy changes into ..... energy.
- 11. Fireworks produce sound and ..... energies which are considered as forms of ..... energy.
- 12. Television needs ..... energy to be operated and changes it into ..... and ..... energies which are forms of kinetic energy.

### 7 Give reasons for :

- 1. Electric lamp produces different forms of energy.  
.....  
.....
- 2. On filling the spring of a toy car, then let it free, the car moves.  
.....  
.....

### 8 What happens if ... ?

- 1. You operate a washing machine. (according to the change of energy).  
.....  
.....
- 2. A boy moves down the slide. (according to the change of energy).  
.....  
.....
- 3. You switch on an electric lamp. (according to the change of energy).  
.....  
.....

### 9 Cross out the odd word :

- 1. Sound energy – Light energy – Thermal energy – Chemical energy. (.....)
- 2. Sound energy – Light energy – Electrical energy – Thermal energy. (.....)
- 3. Radio – Electric fan – Washing machine – Electric mixer. (.....)



**10** Look at the opposite figure, then choose the correct answer :

- The boy number (1) has a big amount of .....
  - potential energy.
  - kinetic energy.
  - both potential and kinetic energies.
  - both potential and light energies.
- The potential energy of the boy number (2) .....
  - increases.
  - decreases.
  - doesn't change.
  - decreases then increases.
- The potential energy of the ball is ..... the boy number (1).
  - more than that of
  - equal to the kinetic energy of
  - equal to that of
  - less than that of





## Exercises on Lesson 4

### 1 Choose the correct answer :

- 1. Chemical energy can be stored in .....
  - a. food and fuel only.
  - b. fuel and battery only.
  - c. battery and food only.
  - d. food, fuel and battery.
- 2. Humans cannot live without ..... to obtain the needed energy for their activities.
  - a. reading books
  - b. driving cars
  - c. watching television
  - d. eating foods
- 3. Humans and cars are .....
  - a. not able to produce sound energy.
  - b. not able to produce kinetic energy.
  - c. similar in obtaining energy to move.
  - d. similar in adaptation to live and survive.
- 4. Petroleum contains ..... that is important for the movement of cars, trucks and boats.
  - a. air
  - b. oxygen
  - c. gasoline
  - d. food
- 5. The part of the car that releases the stored potential energy in gasoline, is the .....
  - a. radio.
  - b. engine.
  - c. tire.
  - d. window.
- 6. As a result of burning gasoline inside the car's engine, its stored chemical energy can be changed into all the following of forms of energy, except .....
  - a. kinetic energy.
  - b. thermal energy.
  - c. sound energy.
  - d. gravitational potential energy.

### 2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Food.	a. It can be transformed into potential energy.
2. Gasoline.	b. It is the source of energy for humans.
3. Kinetic energy.	c. It is the stored energy in an object.
4. Potential energy.	d. It cannot transferred into another form of energy.
	e. Its burning inside an engine produces mechanical energy.

1. ....

2. ....

3. ....

4. ....



**3 Put (✓) or (X) :**

- 1. Orange, potato and battery contain stored chemical energy. ( )
- 2. A car does work, when it moves from one place to another. ( )
- 3. Burning gasoline in an internal combustion engine, transforms energy from one form into another. ( )
- 4. Electric machines are operated by electric energy, and give out different forms of energies. ( )
- 5. Chemical potential energy is the energy that is produced as a result of burning gasoline. ( )
- 6. Burning of food inside our bodies produces energy that allow us to do our activities. ( )

**4 Correct the underlined words :**

- 1. Most types of vehicles need water to move. (.....)
- 2. Fuel inside the car is similar to stomach inside the human body. (.....)
- 3. Gasoline contains electric potential energy. (.....)
- 4. When you turn on a radio, the electrical energy is transformed into light energy. (.....)

**5 Write the scientific term of each of the following :**

- 1. The type of fuel that is used inside the car to obtain kinetic energy. (.....)
- 2. The energy that is stored in both the human food and the car fuel. (.....)
- 3. The part of the car in which the gasoline burns and gives out mechanical energy. (.....)

**6 Complete the following sentences :**

- 1. Gasoline in a car's engine stores chemical potential energy which is changed into ....., ..... and ..... energies.
- 2. Mechanical energy produced from a car's engine is considered one of the forms of ..... energy which causes the ..... of the car.
- 3. Chemical energy is found in many things such as ..... inside a car's engine, in ..... for our bodies and in ..... of a flashlight.
- 4. Food inside the body of living organism is similar to ..... inside the car, where burning each of them changes ..... energy into ..... energy.
- 5. Battery of a toy stores ..... energy which changes into ..... energy that makes the toy moves.



**7 Give reasons for :**

1. Although gasoline stores chemical energy, it is necessary for the car movement.

.....

2. Fuel inside the car is similar to the food inside the human body.

.....

.....

**8 What happens if ... ?**

1. Gasoline does not burn inside the internal combustion engine of a car.

.....

2. Food burns inside the human body.

.....

3. You put a battery inside a flashlight, then switch it on. (according to the change of energy).

.....

.....

**9 Write each of the following words in front of the suitable sentence below :**

(Flashlight – Gas oven – Car's engine – Food)

1. It changes chemical energy into kinetic energy through burning of gasoline. (.....)

2. Its burning changes the chemical energy into kinetic energy inside our bodies. (.....)

3. It changes chemical energy into thermal energy to be used in cooking. (.....)

4. It changes chemical energy into light and thermal energies. (.....)

**10 Complete the following sentences below pictures :**



changes  
into →



changes  
into →



1. Batteries inside the radio store ..... potential energy.

2. .... energy in the wires inside the radio.

3. .... energy produced from the radio speaker.



## Exercises on Lesson 5

## 1 Choose the correct answer :

- 1. All the following forms of energy affects the ice-skater, except .....
  - a. kinetic energy.
  - b. energy obtained from food.
  - c. electrical energy.
  - d. gravitational potential energy.
- 2. When the ice-skater jumps high, the force affecting the skater must be .....
  - a. balanced.
  - b. not balanced.
  - c. created.
  - d. destroyed.
- 3. The force that is found between the ice-skater and the ground, which opposes his movement is known as .....
  - a. pushing force.
  - b. electrical energy.
  - c. magnetic energy.
  - d. friction force.
- 4. The potential energy stored in the skater's body changes into ..... , when the skater begins to skate.
  - a. less active energy
  - b. more active energy
  - c. light energy
  - d. sound energy

## 2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. When the skater is sliding on ice.	a. he has no kinetic energy.
2. When the skater is jumping into the air.	b. his kinetic energy changes into electrical energy.
3. When the skater is standing on ice without moving.	c. he has both kinetic energy and potential energy.
	d. he has only kinetic energy.

1. ....

2. ....

3. ....

## 3 Put (✓) or (X) :

- 1. Transformation of potential energy into kinetic energy during ice-skating, proves that the energy can be created but cannot be destroyed. ( )
- 2. Kinetic energy, muscles of skater and his nervous system, are working together to help him jump high into the air. ( )
- 3. The stored kinetic energy changes into potential energy, when the gravity pulls the skater back down to the ice. ( )



- 4. Energy obtained from food is important for the skater to skate and jump on ice. ( )
- 5. When an ice-skater is jumping at a certain height, the mass of his body doesn't affect his potential energy. ( )

#### 4 Correct the underlined words :

- 1. The kinetic energy stored in skater's body changes into more active energy, at the beginning of skating. (.....)
- 2. At the top of the jump, the skater has the most kinetic energy. (.....)
- 3. When the skater starts jumping, he has the most potential energy. (.....)
- 4. As the height of the skater increases, he stores less kinetic energy. (.....)
- 5. The potential energy increases, when the skater moves fast on ice. (.....)

#### 5 Write the scientific term of each of the following :

- 1. The energy that pulls the skater back down to the ice during his jumping. (.....)
- 2. The energy that is stored in the skater's body during his jumping into the air. (.....)
- 3. The energy that is produced when the skater begins to skate on ice. (.....)

#### 6 Complete the following sentences :

- 1. When a skater begins to skate, his stored .....energy changes into ..... energy.
- 2. When a skater is found at the highest point in the air, the ..... pulls him back down to the ice.
- 3. At the beginning of skating, the skater has the ..... kinetic energy, while when he starts jumping he has the ..... kinetic energy.
- 4. A skater has the most ..... energy when he reaches the top of his jump, while he has the most ..... energy when he starts jumping.

#### 7 Give reasons for :

- 1. Skater has the most potential energy when he is found at the top of the jump.  
.....
- 2. When a skater reaches the highest point in the air, he starts to move back down to the ice.  
.....

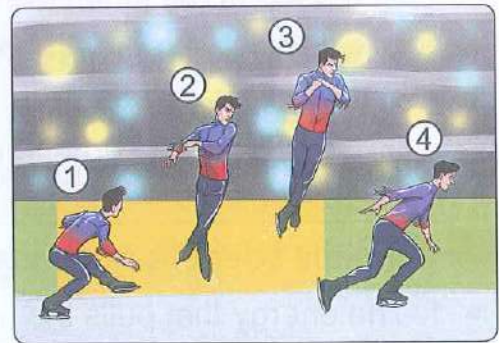


**8** What happens if ... ?

- A skater begins to skate. (according to the change of his energy).  
.....
- A skater starts to jump through the air. (according to the change of his energy).  
.....

**9** Look at the following figure that shows a skater in different positions during skating, then choose the correct answer :

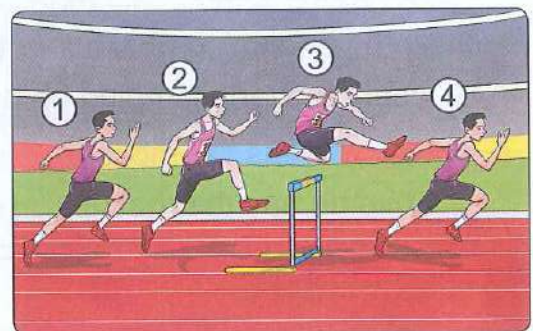
- The skater in position number ..... has the most potential energy.
  - 1
  - 2
  - 3
  - 4
- The skater in position number ..... has the least kinetic energy.
  - 1
  - 2
  - 3
  - 4



- All the following statements are correct except .....
  - potential energy in position ③ is the most.
  - kinetic energy in position ① is the least.
  - potential energy in position ③ is less than that in position ④.
  - potential energy changes into kinetic energy as the skater moves from position ① to position ②.

**10** Look at the opposite figure, then choose the correct answer :

- The runner has the most potential energy in position number .....
  - 1
  - 2
  - 3
  - 4
- The runner in position number ① has .....
  - the most potential energy.
  - the least kinetic energy.
  - the most kinetic and potential energies.
  - neither kinetic nor potential energies.





# Exercises

## on Lessons of Concept (2.3)

● Understand

● Apply

● Analyze

● Evaluate

● Create

### Exercises on Lesson 1

#### 1 Choose the correct answer :

- The distance that the object travelled is measured in .....
  - kilometers or kilograms.
  - meters or grams.
  - kilometers or grams.
  - kilometers or meters.
- The time taken by an object to travel a certain distance is measured in .....
  - hours or meters.
  - hours or seconds.
  - meters or seconds.
  - kilometers or hours.
- The speed of an object is measured in ..... or meters per second.
  - kilograms per hour
  - grams per second
  - kilometers per hour
  - kilograms per kilometers
- Cheetah is one of the ..... species.
  - cat
  - amphibians
  - reptiles
  - birds
- When the cheetah increases its speed, its kinetic energy .....
  - decreases.
  - becomes zero.
  - increases.
  - doesn't change.
- Which of the following statements is true ? .....
  - Cheetahs run slower than humans.
  - Dogs run faster than cheetahs.
  - Cheetahs run slower than dogs.
  - Cheetahs run faster than humans.
- Cheetah's nose has large openings, which help it .....
  - breathe a lot of air.
  - breathe a little amount of air.
  - hide from its predator.
  - hide from its prey.
- Cheetah has a ..... heart.
  - large weak
  - small weak
  - large powerful
  - small powerful
- Cheetah sticks its ..... into the ground while running.
  - nose
  - backbone
  - head
  - claws



**2 Choose from column (B) what suits it in column (A) :**

(A)	(B)
1. Cheetah's head	a. is lightweight.
2. Cheetah's nose	b. is flexible.
3. Cheetah's spine	c. is heavyweight.
4. Cheetah's body	d. has large openings.
	e. is low to its shoulder.

1. ....

2. ....

3. ....

4. ....

**3 Put (✓) or (X) :**

- 1. Cheetah is the fastest land animal on the Earth. ( )
- 2. The high speed of cheetah helps it to survive as a prey. ( )
- 3. Having the cheetah's head lower than its shoulder helps it in increasing the air resistance. ( )
- 4. Cheetah's backbone is flexible and acts like a spring for its leg muscles. ( )
- 5. The small size of cheetah's heart help it in running so fast. ( )
- 6. A rocket can travel faster than a car. ( )
- 7. If two objects travel for equal amount of time, the object that travels a greater distance have a slower speed. ( )

**4 Write the scientific term of each of the following :**

- 1. One of the measuring units of distance. (.....)
- 2. One of the measuring units of time. (.....)
- 3. It is the fastest land animal in the world. (.....)
- 4. A structure in cheetah's body that sticks into the ground while running. (.....)
- 5. A structure in cheetah's body that is flexible and acts like a spring for its leg muscles. (.....)

**5 Complete the following sentences :**

- 1. To measure the speed of a train, we must know the ..... that the train travelled and the ..... taken by this train to travel this trip.
- 2. We can measure the speed of a car in ..... per ..... and also ..... per .....
- 3. The ..... is one of the cat species which is considered as the fastest land animal.



- 4. The train can reach 96.5 kph in time ..... than that of the cheetah.
- 5. The cheetah's head is ..... to the shoulder, to help it moves fast and decreases the ..... resistance.
- 6. Cheetah has a flexible ..... that acts as a spring for its leg muscles, while it sticks its ..... into the ground to push off the ground during running.
- 7. We can say that car (A) is faster than car (B), when car (A) travels a longer ..... in the same amount of .....

### 6 Give reasons for :

- 1. The head of the cheetah is low to its shoulder.

.....  
 .....

- 2. The nose of the cheetah has large openings.

.....  
 .....

- 3. Cheetah sticks its claws into the ground during running.

.....  
 .....

### 7 What happens if ... ?

- 1. A runner and a horse run for 5 minutes. (according to the covered distance).

.....

- 2. Cheetah has a heavy weight body.

.....

- 3. The cheetah's head became high above to its shoulder.

.....

- 4. Cheetah has a small heart.

.....

- 5. The cheetah doesn't sticks its claws into the ground during running.

.....

### 8 If a cheetah runs behind a running deer. In your opinion, can the cheetah reach the deer and hunts it ? (Give a reason for your answer).

.....  
 .....



- 9 Rearrange the following moving objects according to their speed from the fastest to the slowest.



Figure (1)



Figure (2)



Figure (3)



Figure (4)



Figure (5)

Figure (.....) → Figure (.....) → Figure (.....) →

Figure (.....) → Figure (.....)



## Exercises on Lesson 2

### 1 Choose the correct answer :

- 1. Speed is a measurement of how ..... something is moving.
  - a. long                      b. tall                      c. fast                      d. heavy
- 2. Speed measures the distance that an object travels over .....
  - a. time.                      b. size.                      c. volume.                      d. mass.
- 3. If an object (A) moves 10 meters forward in 1 second and object (B) moves 10 meters backward in 1 second so, .....
  - a. speed of object (A) is greater than speed of object (B).
  - b. speed of object (B) is greater than speed of object (A).
  - c. speed of object (A) and object (B) are similar.
  - d. speed of object (A) and object (B) are different.
- 4. How can we calculate the speed of an object ? .....
  - a. Speed = distance ÷ time                      b. Speed = distance x time
  - c. Speed = distance + time                      d. Speed = distance – time
- 5. Which of the following is a measuring unit of speed ? .....
  - a. hr/km.                      b. sec/m.                      c. kg/sec.                      d. m/sec.
- 6. What is the speed of a car that travels 400 meters in 4 second ? .....
  - a. 100 m/sec.                      b. 20 m/sec.                      c. 30 m/sec.                      d. 40 m/sec.
- 7. What is the speed of a man who runs 6 kilometers in 1 hour ? .....
  - a. 3 km/hr.                      b. 9 km/hr.                      c. 6 km/hr.                      d. 6 m/sec.
- 8. During 2 hours , car (A) covered 4 kilometers, while car (B) covered 6 kilometers. Which of the following sentences is incorrect ? .....
  - a. The speed of car (A) is greater than the speed of car (B).
  - b. The speed of car (B) is greater than the speed of car (A).
  - c. The speed of car (A) is smaller than the speed of car (B).
  - d. Car (A) and car (B) have different speeds.

### 2 Put (✓) or (X) :

- 1. All objects move at similar speeds around us. (    )
- 2. If two objects covered the same distance in the same time so, they have similar speed. (    )



- 3. We can measure the covered distance in kilometer unit. ( )
- 4. If car (A) covered a distance of 100 kilometers in one hour and car (B) covered a distance of 100 kilometers in two hours so, car (B) is faster than car (A). ( )
- 5. A train is faster than a bicycle. ( )
- 6. Walking for two kilometers takes a shorter time than running for the same distance. ( )
- 7. If the speed of a moving object equals 7 km/hr , this means that this object can cover 8 kilometers in one hour. ( )

### 3 Correct the underlined word :

- 1. A car can move in a traffic jam faster than on the highway. (.....)
- 2. The distance travelled in a certain amount of time represents the force. (.....)
- 3. An object moves 5 kilometers in one hour has a greater speed than another object moves 10 kilometers in one hour. (.....)
- 4. Energy = distance ÷ time. (.....)
- 5. An airplane is slower than a train. (.....)

### 4 Complete the following sentences :

- 1. The speed of a car on the highway is ..... than that of a car in a traffic jam.
- 2. The speed of a car moves forward 30 meters in 5 seconds is ..... the speed of the same car moves backward 30 meters in 5 seconds.
- 3. The speed depends on the distance that is measured in kilometer or ..... and the time that is measured in ..... or .....
- 4. To measure the speed of a moving bicycle we need to divide the ..... it travels by the ..... it takes to travel this trip.
- 5. To compare the speed of a car to the speed of a truck, we need to measure the ..... in the same amount of time, or measure the ..... taken to travel the same distance.
- 6. The speed of two objects are equal, if they cover the same ..... at the same amount of .....
- 7. We can say that the moving object is fast when it covers a long ..... in a short period of .....
- 8. You can arrive your house using a bicycle in a time ..... than the time taken when you use a car.
- 9. A car covers 80 meters in 4 seconds, so it moves at a speed equals ..... m/sec.



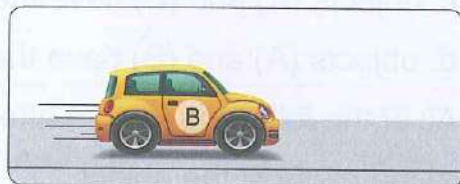
**5 Give reasons for :**

- 1. The measuring unit of speed is km/hr or m/sec.  
.....
- 2. You take a long time to arrive your house when using a bicycle instead of a bus.  
.....

**6 What happens if a person rides a bicycle instead of walking to reach his house.**

.....  
.....

**7 Calculate the speed of each of the following two cars, then choose which of them is the faster.**



- The distance it covers = 100 km.
- The time taken = 1 hour.

- The distance it covers = 80 km.
- The time taken = 1 hour.

1. Its speed = ..... ÷ ..... = ..... km/hr.      2. Its speed = ..... ÷ ..... = ..... km/hr.

3. From the previous results, you can conclude that the faster car is .....

**8 Which of the following cars is the fastest :**

- Car (A) covers distance 30 kilometers in 1 hour.
- Car (B) covers distance 200 kilometers in 2 hours.
- Car (C) covers distance 600 kilometers in 3 hours.

.....  
.....  
.....

**9 Find the speed of a runner, if you know that he covers 400 meters in 8 seconds.**

.....  
.....

**10 A train travels from Cairo to Alexandria in a distance of 200 kilometers in 2 hours. Find its speed.**

.....  
.....



**Exercises on Lesson 3****1 Choose the correct answer :**

- 1. By increasing the speed of a ball travels down a ramp, its kinetic energy .....
  - a. increases.
  - b. decreases.
  - c. doesn't change.
  - d. becomes zero.
- 2. If the speed of object (A) that travels down the ramp is greater than the speed of object (B) on the same ramp so, .....
  - a. the mass of object (A) is greater than the mass of object (B).
  - b. the mass of object (B) is greater than the mass of object (A).
  - c. objects (A) and (B) have the same mass.
  - d. objects (A) and (B) have the same color.
- 3. All of the following factors affect the speed of an object on a ramp except .....
  - a. the mass of the object.
  - b. the type of the ramp's surface.
  - c. the friction between the object and the ramp's surface.
  - d. the color of the object.
- 4. The speed of a ball moves down a ramp increases by increasing its ..... , but its speed decreases by increasing the .....
  - a. friction force – mass.
  - b. mass – friction force.
  - c. temperature – mass.
  - d. mass – temperature.

**2 Put (✓) or (X) :**

- 1. The object that travels down a ramp is affected by the force of gravity. ( )
- 2. Objects with different masses travel down a ramp at different speeds. ( )
- 3. By changing the height of the ramp, the speed of a ball moves on it changes. ( )
- 4. The speed of a ball doesn't change if it is pushed with the same force on a smooth surface then on a rough surface. ( )

**3 Complete the following sentences :**

- 1. If you move two balls with different masses on a ramp, the speed of the large mass ball is ..... than that of the small mass ball.
- 2. To increase the speed of any object moving on a ramp we can increase the ..... of the ramp.



- 3. The speed of cheetah will ..... when it runs down a hill in the forest.
- 4. The speed of a moving object on a smooth ramp is ..... than that of the same object that moves on a rough ramp.

**4 Give a reason for the following :**

- The time taken by a moving car to cover a certain distance is short when that distance is on a ramp road.

.....  
 .....

**5 What happens if we increase the height of the ramp on which a toy car moves.**

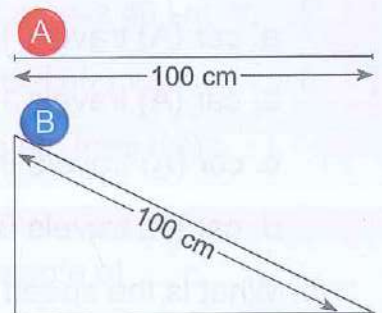
(according to the speed of the toy car)

.....  
 .....

**6 In the opposite figure, if you push two similar balls with two equal forces on two similar surfaces have the same length which is 100 cm.**

Which ball will reach the end point of the surface in shorter time. (Give a reason for your choice)

.....  
 .....





## Exercises on Lesson

4

## 1 Choose the correct answer :

- To calculate the speed of a bicycle, we use the relation .....
  - distance = speed  $\div$  time
  - distance = time  $\div$  speed
  - speed = distance  $\div$  time
  - speed = time  $\div$  distance
- A moving bus covers a distance of 100 meter in 5 second, so its speed equals .....
  - 5 m/sec.
  - 10 m/sec.
  - 15 m/sec.
  - 20 m/sec.
- A train travels 360 kilometers in 3 hours, so its speed equals .....
  - 100 km/hr.
  - 120 km/hr.
  - 140 km/hr.
  - 160 km/hr.
- If two cars (A) and (B) move on the same road for 5 seconds, we can say that car (B) has the greater speed, when ..... at this time.
  - car (A) travels 100 meters, and car (B) travels 80 meters
  - car (A) travels 100 meters, and car (B) travels 100 meters
  - car (A) travels 80 meters, and car (B) travels 80 meters
  - car (A) travels 80 meters, and car (B) travels 100 meters
- What is the speed of a boy who walks 3 meters in 6 seconds ? .....
  - $\frac{1}{2}$  m/sec.
  - $\frac{1}{3}$  m/sec.
  - $\frac{1}{4}$  m/sec.
  - 1 m/sec.
- As the angle of the incline decreases, the speed of a toy car rolling on it ..... and its kinetic energy .....
  - increases – decreases.
  - increases – increases.
  - decreases – decreases.
  - decreases – increases.
- The car that covers 80 kilometers in 1 hour is slower than a car covers .....
  - 60 kilometers in 1 hour.
  - 40 kilometers in 1 hour.
  - 100 kilometers in 1 hour.
  - 50 kilometers in 1 hour.



**2 Choose from column (B) what suits it in column (A) :**

(A)	(B)
1. By increasing the speed of an object	a. its speed equals 10 m/sec.
2. By decreasing the speed of an object	b. its speed equals 100 km/hr.
3. An object covers 90 meters in 9 seconds	c. its speed equals 100 m/sec.
4. A train covers 200 kilometers in 2 hours	d. its kinetic energy decreases. e. its kinetic energy increases.

1. .... 2. .... 3. .... 4. ....

**3 Put (✓) or (X) :**

- 1. The car that travels 80 kilometers in 2 hours has a speed equals 40 km/hr. ( )
- 2. The bus that covers 60 kilometers in 1 hour has a speed = 60 m/sec. ( )
- 3. If two objects cover the same distance in the same time so, they have the same speed. ( )
- 4. The speed of a ball moves on a ramp increases as the angle of the incline decreases. ( )
- 5. The angle of the incline affects the speed of an object moving on it. ( )

**4 Correct the underlined word :**

- 1. If a car moves 120 kilometers in 3 hours so, its speed = 30 km/hr. (.....)
- 2. If a bird flies for a distance = 100 kilometers in 4 hours so, its speed = 50 m/sec. (.....)
- 3. The speed of a bicycle can be calculated from the relation :  
speed = time + distance (.....)
- 4. If car (A) covers a greater distance than car (B) in the same time so, we can say that car (B) is faster than car (A). (.....)
- 5. When the speed of an object increases, its kinetic energy decreases. (.....)



**5 Complete the following sentences :**

- 1. When we say that car moves by a speed equals 10 m/sec. , this means that the car travels ..... meters every .....
- 2. When two cars move on the same road, car (A) moves at speed equals 10 m/sec., and car (B) moves at speed equals 20 m/sec., this means that car ..... moves longer distance than car ..... in the same time.
- 3. If a bicycle moves a distance 30 meters in 5 seconds, so its speed equals .....
- 4. If an object moves on a ramp, its speed will ..... as the angle of inclination of this ramp increases.
- 5. If two balls hit two paper cups with different forces, the farther the cup moves after hitting has more ..... energy.
- 6. If the kinetic energy of a moving body decreases, its speed will .....
- 7. If a truck moves with a high speed, so it has more ..... energy.

**6 Give reasons for :**

- 1. The toy car that moves on a ramp has a big amount of kinetic energy.  
.....  
.....
- 2. The speed of an object moves down a ramp depends on the angle of inclination of the ramp.  
.....  
.....

**7 What happens if ... ?**

- 1. We increase the angle of inclination of a ramp on which a toy car moves.  
(according to the kinetic energy of the car).  
.....  
.....
- 2. We decrease the speed of a moving bicycle.  
(according to the kinetic energy of the bicycle).  
.....  
.....

**8 A car moves forward a distance 100 kilometers in time equal 2 hours, calculate the speed of the car.**

.....  
.....



**9** Car (A) and car (B) move on the same road at different speeds, where car (A) moves 80 kilometers in 1 hour, and car (B) moves 200 kilometers in 4 hours.

1. Calculate the speed of each car.

• Speed of car (A) =  $\frac{\text{Distance}}{\text{Time}}$  =  $\frac{\text{.....}}{\text{.....}}$  = .....

• Speed of car (B) =  $\frac{\text{Distance}}{\text{Time}}$  =  $\frac{\text{.....}}{\text{.....}}$  = .....

2. Determine which car is faster than the other and give a reason for your answer.

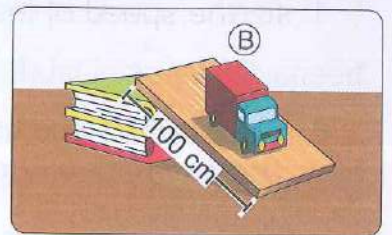
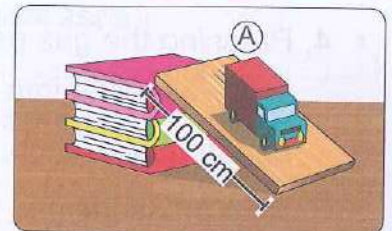
.....  
 .....

**10** The opposite figure shows two similar toy trucks.

Which toy truck has the greatest speed ?

(Give a reason for your answer).

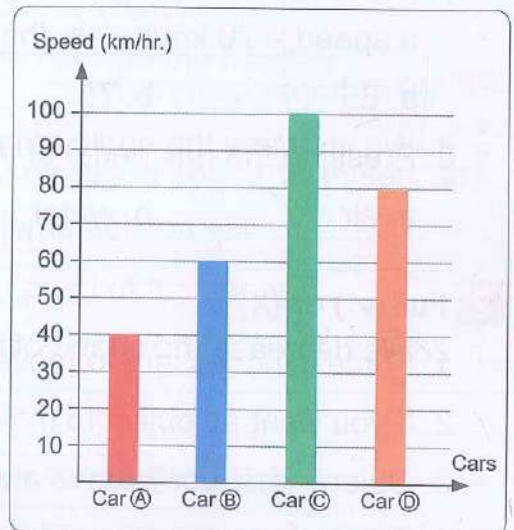
.....  
 .....  
 .....  
 .....  
 .....



**11** Look at the opposite graph that shows four cars move with different speeds, then complete the following sentences :

1. Car ..... is the fastest car, while car ..... is the slowest one.
2. Car (B) covers ..... kilometers in 1 hour.
3. Car (D) is faster than car ..... and car ....., but it is slower than car .....
4. We can arrange the four cars according to their speeds from the fastest to the slowest as follows :

Car ..... → Car ..... → Car ..... → Car .....





## Exercises on Lesson

5

## 1 Choose the correct answer :

- 1. Moving faster or slower means that there is a change in the ..... of an object.  
a. direction      b. speed      c. color      d. temperature
- 2. If we stop pedaling, the bicycle begins to .....  
a. slow down.      b. speed up.  
c. change its direction.      d. change its mass.
- 3. To increase the speed of a moving object, you must give it more ..... energy.  
a. light      b. potential      c. sound      d. kinetic
- 4. Pressing the gas pedal of a car allows the engine to convert more ..... energy in the gasoline into kinetic energy.  
a. potential      b. light      c. thermal      d. sound
- 5. If we press the gas pedal while the car is moving on a road at a speed = 70 km/hr. so, the speed of the car may reach ..... km/h.  
a. 20      b. 40      c. 60      d. 80
- 6. The friction force between ..... and the road causes a decrease in the speed of the car.  
a. can tires      b. car horn      c. gas pedal      d. car door
- 7. If a driver reduces pressing the gas pedal while his car is moving on a road at a speed = 70 km/hr. so, the speed of the car may reach ..... km/hr.  
a. 65      b. 75      c. 85      d. 95
- 8. Pressing the gas pedal of a car sends more ..... into the engine.  
a. air      b. water      c. milk      d. fuel

## 2 Put (✓) or (X) :

- 1. Force is necessary to move or stop an object. ( )
- 2. If you want an object to move slower, you must give it more kinetic energy. ( )
- 3. Objects that don't move always have kinetic energy. ( )
- 4. By pressing the gas pedal of a car, more potential energy is converted into kinetic energy inside the engine. ( )
- 5. If the driver takes his foot off the gas pedal, the amount of gasoline sent to the engine is decreased. ( )
- 6. The friction between the tires and the road increases the speed of the car. ( )



- 7. The speed of a bicycle that covers 24 meters in 8 seconds is 4 m/sec. ( )
- 8. The speed of a train that covers 350 kilometers in 5 hours is greater than the speed of a car that covers 120 kilometers in 2 hours. ( )

### 3 Correct the underlined words :

1. If we reduce the kinetic energy of a moving car, its speed will increase.  
(.....)
2. When pushing force is applied to an object that doesn't move so, its speed decreases.  
(.....)
3. If a driver presses the gas pedal of a car, more light energy is converted into kinetic energy in the engine.  
(.....)
4. The friction between the car's windows and the road decreases the speed of the car.  
(.....)
5. If you ride a bicycle and cover 30 kilometers in 2 hours so, your speed = 20 km/hr.  
(.....)

### 4 Complete the following sentences :

- 1. To increase the ..... energy of any moving object we must increase its speed.
- 2. To increase the speed of a moving car, we need to ..... the force that acts on it.
- 3. When the driver presses the gas pedal, the ..... potential energy stored in the fuel is converted into ..... energy inside the engine.
- 4. The kinetic energy of the car engine provides the car with the needed ..... that turns the wheels to go.
- 5. Car (A) moves at a speed 10 m/sec. and car (B) moves at speed 15 m/sec. so, the force acts on car ..... is larger than the force acts on car .....
- 6. If the driver takes his foot off the gas pedal, the speed of the car will ..... gradually until it stops due to the ..... between the car tires and the road.

### 5 Give reasons for :

- 1. To slow down any moving object we must reduce its kinetic energy.  
.....  
.....
- 2. If a driver wants a car to go faster, he presses the gas pedal.  
.....  
.....



**6** What happens if ... ?

1. The driver presses the gas pedal of a car.

.....  
 .....

2. The driver takes his foot off the gas pedal of a car.

.....  
 .....

**7** Ahmed went to a toy shop to buy a new toy car, he found 3 toy cars that move with different speeds, where :

- Car (A) moves a distance 12 meters in 6 seconds.
- Car (B) moves a distance 9 meters in 3 seconds.
- Car (C) moves a distance 20 meters in 5 seconds.

1. Calculate the speed of each car.

- Speed of car (A) =  $\frac{\text{.....}}{\text{.....}}$  =  $\frac{\text{.....}}{\text{.....}}$  = .....

- Speed of car (B) =  $\frac{\text{.....}}{\text{.....}}$  =  $\frac{\text{.....}}{\text{.....}}$  = .....

- Speed of car (C) =  $\frac{\text{.....}}{\text{.....}}$  =  $\frac{\text{.....}}{\text{.....}}$  = .....

2. Which toy car Ahmed prefers to buy ? (Give a reason for your answer).

.....  
 .....



## Exercises on Lesson 6

### 1 Choose the correct answer :

1. Designing cars and thinking about how to use energy needs .....  
 a. dentists.      b. teachers.      c. pilots.      d. mechanical engineers.
2. Most cars around us use ..... as a fuel.  
 a. gasoline      b. sunlight      c. batteries      d. water
3. Electric vehicles have ..... that must be charged.  
 a. doors      b. fuel      c. batteries      d. tires
4. Solar vehicles can go faster if we .....  
 a. increase its weight.      b. decrease its weight.  
 c. change its color.      d. decrease its speed.
5. All of the following are from the advantages of using the sunlight in solar vehicles except that .....  
 a. these vehicles don't need gasoline.  
 b. these vehicles don't need electric charging.  
 c. these vehicles don't cause climate change.  
 d. these vehicles don't produce a great amount of energy.

### 2 Put (✓) or (X) :

1. Cars need energy to move. ( )
2. All types of cars use gasoline as a fuel. ( )
3. Car exhausts don't cause environmental changes. ( )
4. Electric vehicles have batteries that must be charged. ( )
5. If the car runs out of fuel, it can continue moving. ( )
6. The weight of any car affects its speed. ( )

### 3 Correct the underlined word :

1. Doctors help design cars and think about using energy. (.....)
2. The amount of energy we can get from the Sun is greater than the amount of energy we can get from gasoline. (.....)
3. Increasing the weight of solar vehicles causes the increasing of its speed. (.....)
4. We can calculate the speed of a solar vehicle by knowing two factors which are distance and weight . (.....)



**4 Complete the following sentences :**

- 1. Engineers go to reduce the weight of the solar vehicle to increase its .....
- 2. Solar vehicles have some advantages such as, they don't need ..... or charging and also they don't cause ..... change.
- 3. The amount of energy that we can capture (get) from the Sun is ..... than that we can get from gasoline or an car electric batteries.
- 4. To calculate the speed of a solar vehicle we need to know the ..... and the ..... because the solar vehicle doesn't have .....
- 5. The speed of ..... vehicles is slower than that of normal vehicles and ..... vehicles.

**5 Give reasons for :**

- 1. Mechanical engineers go to reduce the weight of the solar vehicle.

.....  
 .....

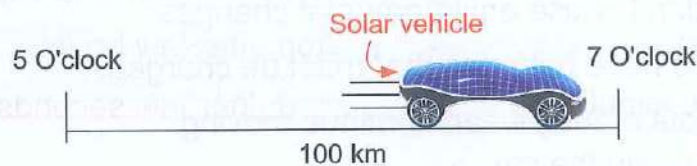
- 2. We cannot know the speed of the solar vehicle during driving.

.....  
 .....

**6 What happens if ... ?**

- The weight of the solar vehicle becomes heavy.

.....  
 .....

**7**

**The opposite figure shows a solar vehicle travels a distance of 100 kilometers between 5 o'clock and 7 o'clock. Calculate the speed of this solar vehicle.**

- The time taken = 7 - ..... = ..... hours

- The speed of solar vehicle =  $\frac{\text{.....}}{\text{Time}} = \frac{\text{.....}}{\text{.....}} = \text{.....}$



# Exercises

## on Lessons of Concept (2.4)

● Understand

● Apply

● Analyze

● Evaluate

● Create

### Exercises on Lesson 1

#### 1 Choose the correct answer :

- When the objects collide with each other, ..... is transferred between them.
  - time
  - distance
  - energy
  - nothing
- The object that has the most kinetic energy, is ..... object.
  - the fastest and lightest
  - the slowest and lightest
  - the fastest and heaviest
  - the slowest and heaviest
- When the cricket bat hits the ball, the ball direction ..... and the ball speed .....
  - doesn't change – doesn't change.
  - doesn't change – changes.
  - changes – doesn't change.
  - changes – changes.
- Collisions usually produce .....
  - solar energy.
  - sound energy.
  - gravitational potential energy.
  - chemical potential energy.
- If there is nothing to stop the movement of an object, this object will .....
  - stay in motion.
  - stop after few hours.
  - stop after few minutes.
  - stop after few seconds.
- Seatbelts work when the car .....
  - decreases its speed gradually.
  - increases its speed gradually.
  - suddenly stops.
  - stops gradually.
- When a car stops suddenly, the passengers move .....
  - backward.
  - forward.
  - upward.
  - downward.
- Airbag is folded into all the following places in the car, except .....
  - steering wheel.
  - dashboard.
  - doors.
  - tires.



## 2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Wrecking ball	a. it is one of the safety equipment in cars, that is inflated with a gas during crashes.
2. Cricket bat	b. it changes its sound energy into light energy.
3. Seatbelt	c. it is used to hit a ball during playing.
4. Airbag	d. it is one of the safety equipment in cars, that keeps passengers in their places during crashes.
	e. it is used to hit a wall during destruction of a building.

1. ....

2. ....

3. ....

4. ....

## 3 Put (✓) or (X) :

- 1. When a cricket bat hits the ball, its potential energy transfers to the ball. ( )
- 2. Seatbelt enables the driver to see the road clearly. ( )
- 3. Seatbelt is one of the safety equipment in cars. ( )
- 4. During a crash between two cars, the potential energy transfers from the faster car to the slower one. ( )
- 5. After car collision, the airbags deflate as fast as they inflate. ( )
- 6. When a fast car hits a very big tree, the kinetic energy of the car transfers into the tree. ( )

## 4 Write the scientific term of each of the following :

- 1. A heavy steel ball that swings on a cable, and is used in destruction of parts of buildings. (.....)
- 2. Safety equipment used to prevent car passengers from moving forward, when the car stops suddenly. (.....)
- 3. Safety equipment used to provide soft cushion, when it is inflated automatically with a gas during collision of cars. (.....)
- 4. They are present in car airbags, and allow them to deflate fast after collision. (.....)

## 5 Correct the underlined words :

- 1. Fast and heavy object has more potential energy than a slow and light object. (.....)
- 2. Football is used to collide with buildings to knock down their walls. (.....)
- 3. When a train at a high speed hits a car, the train gets more damage. (.....)



4. As a result of hitting the ball with the wooden bat, the speed of the ball doesn't change. (.....)
5. Seatbelts absorb the energy of the car due to its collision and gets inflated. (.....)
6. Airbags are made up of thick wooden material. (.....)
7. The cricket bat transfers its light energy to the ball. (.....)

### 6 Complete the following sentences :

- 1. When a fast big ball hits a slow small ball, the big ball has more energy as it is ..... and ..... than the small ball.
- 2. When a bat hits a ball strongly, the ..... energy of the bat is transferred to the ball and the speed of the ball .....
- 3. Among safety equipment which are used during collision of cars ..... and .....
- 4. As a result of collision between the ball and the bat the direction of the ball will .....
- 5. During a car crash, the ..... is inflated with a gas to provide a soft cushion.
- 6. Airbags absorb the ..... of the car during collision.
- 7. When objects collide with each other, ..... is transferred between them.
- 8. In cars, the ..... prevents the passenger from moving forward when the car stops suddenly.

### 7 Give reasons for :

- 1. The speed of the ball increases when the bat hits it hardly.  
.....
- 2. Seatbelts in cars are very important.  
.....
- 3. Airbags in cars are very important.  
.....  
.....

### 8 What happens if ... ?

1. The moving cricket bat hits a ball (according to the transfer of energy).  
.....
2. The airbags in a car don't inflate during a crash.  
.....



**9** Look at the opposite photo that shows a tennis player, then choose the correct answer :



1. When the player hits the ball,..... energy is transferred from the bat to the ball.
  - a. sound
  - b. kinetic
  - c. electrical
  - d. light
2. .... energies are produced from the collision between the bat and the ball.
  - a. Electrical and kinetic
  - b. Kinetic and light
  - c. Electrical and sound
  - d. Kinetic and sound
3. When the bat hits the ball, the ..... of the ball is changed.
  - a. size
  - b. mass
  - c. direction
  - d. color
4. During hitting the ball with the bat, all the following sentences are correct except .....
  - a. the ball changes its direction.
  - b. the kinetic energy of the bat transfers to the ball.
  - c. the speed of the ball changes.
  - d. the size of the ball decreases.

**10** Look at the following photo that shows a crash between a train and a car, then answer the questions below :



- 1. In your opinion, which one of them is damaged more than the other ? (Give a reason for your answer).  
.....  
.....
- 2. What happens to the car airbags during the crash ?  
.....  
.....



## Exercises on Lesson 2

### 1 Choose the correct answer :

- 1. When two objects of the same mass move with the same speed collide with each other, the resulted damage .....
  - a. is larger in one of them and smaller in the other.
  - b. is equal in both of the two objects.
  - c. doesn't depend on the mass of the two objects.
  - d. doesn't depend on the speed of the two objects.
- 2. Collision usually include, .....
  - a. energy creation only.
  - b. energy creation and energy destruction.
  - c. energy transferring only.
  - d. energy transferring and energy transforming.
- 3. An object stays moving with its same speed, when .....
  - a. its kinetic energy decreases.
  - b. its potential energy increases.
  - c. no another force stops it.
  - d. another object collides with it.
- 4. If we hit a ball with a wooden bat, the energy of the wooden bat .....
  - a. will remain as it is in the wooden bat.
  - b. will transform into light energy in the ball.
  - c. will transfer into the ball.
  - d. will be destroyed and no longer be existed.
- 5. To stop the movement of an object, you can collide it with another object that has .....
 

a. much more kinetic energy.	b. much more thermal energy.
c. much more light energy.	d. much more sound energy.
- 6. The two factors affecting the kinetic energy of an object are ..... of this object.
 

a. the speed and the color	b. the mass and the color
c. the speed and the mass	d. the light and the sound energies
- 7. The mass of an object, .....
  - a. doesn't affect its potential energy or its kinetic energy.
  - b. affects its potential energy and its kinetic energy.
  - c. affects its potential energy only.
  - d. affects its kinetic energy only.



## 2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. A heavy object that doesn't move	a. has much kinetic energy.
2. A light object that doesn't move	b. has much light energy.
3. A fast object with a heavy mass	c. if it moves with a fast speed, it has much kinetic energy.
4. A slow object with a light mass	d. has low kinetic energy.
	e. if it moves with a low speed, it has low kinetic energy.

1. ....

2. ....

3. ....

4. ....

## 3 Put (✓) or (X) :

- 1. Fast-moving objects can be exposed to less damage than slow ones. ( )
- 2. Slower and lighter object has much kinetic energy. ( )
- 3. We cannot create a new form of energy, and also we cannot destroy an existed form of energy. ( )
- 4. You have to drive a car as fast as possible, because at high speeds you can avoid collisions. ( )
- 5. To increase the speed of a moving object, you can collide it with another object moves in the opposite direction and has much more kinetic energy. ( )
- 6. When two heavy and fast cars are in an opposite direction, collide together they produce very small amount of damage. ( )

## 4 Write the scientific term of each of the following :

- 1. The process in which two objects or more crash into each other, and including an energy transfer. (.....)
- 2. The energy that can be heard and usually produced when two objects collide with each other. (.....)
- 3. The liquid that stores chemical energy, and it is used to move cars. (.....)

## 5 Correct the underlined word :

- 1. When two cars collide with each other, the potential energy transfers from the faster car to the slower car. (.....)



2. The speed of an object affects its potential energy. (.....)
3. Two objects of the same mass and stopped at the same height, have the same kinetic energy. (.....)

### 6 Complete the following sentences :

- 1. The moment where two objects hit or make contact in a forceful way is called .....
- 2. When a moving car hits a tree, a part of ..... energy of the car changes into a ..... energy which you hear it.
- 3. When the speed of a car increases, its ..... energy increases.
- 4. A car with speed = 60 km/hr., its kinetic energy is ..... than that of another car with speed = 40 km/hr.
- 5. During running, deer has kinetic energy less than cheetah, because cheetah has speed ..... than that of deer.
- 6. When two cars collide with each other, some of transferred energy may be in the form of heat , ..... and .....

### 7 Give reasons for :

- 1. When two objects collide with each other, you can hear a sound.

.....  
 .....

- 2. Driving fast is very dangerous.

.....  
 .....

### 8 What happens if ... ?

1. The speed of a car increases. (according to its kinetic energy)

.....  
 .....

2. Two bicycles move in an opposite direction, collide with each other.

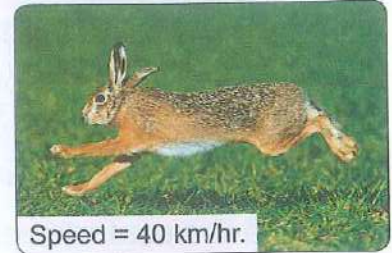
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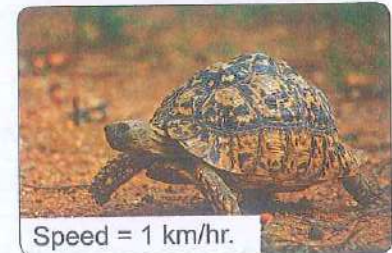
**9** Look at the opposite photos then answer the questions below :

1. Which one of the two animals has the most kinetic energy ?  
(Give a reason for your answer).

.....  
.....



2. If the speed of the rabbit decreases, so its kinetic energy will ..... (Complete).



**10** Look at the opposite photo, then choose the correct answer :

1. The car has ..... energy that allows it to move on the road.

a. light

b. sound

c. kinetic

d. thermal

2. If the driver changes the ..... of the car, its kinetic energy will change.

a. color

b. speed

c. lights

d. temperature



3. All the following actions decrease the dangers that may be caused as a result of the collision except .....

a. increasing the speed of the car.

b. wearing the seatbelt.

c. adding more airbags to the car.

d. decreasing kinetic energy of the car.



## Exercises on Lesson 3

### 1 Choose the correct answer :

- 1. A very big truck needs ..... to move.
  - a. very small engine
  - b. small engine
  - c. very big engine
  - d. no engine
- 2. As the force that acts on an object increases, its ability to do work .....
  - a. increases.
  - b. decreases.
  - c. doesn't changed.
  - d. destroyed.
- 3. When a moving car decreases its speed then stops, so .....
  - a. its kinetic energy becomes zero.
  - b. its light energy only becomes zero.
  - c. its light energy and thermal energy become zero.
  - d. its kinetic energy becomes equal to its thermal energy.
- 4. The amount of fuel that is used in a big truck to produce a certain amount of kinetic energy is ..... the amount of fuel in a small car to get the same amount of kinetic energy.
  - a. less than
  - b. equal to
  - c. more than
  - d. half to
- 5. On a flat road, if a large truck is traveling at the same speed of a small car, then the truck has .....
  - a. more kinetic energy.
  - b. less kinetic energy.
  - c. the same kinetic energy of the car
  - d. no kinetic energy at all.
- 6. If an object moves down along a ramp, as the angle of the ramp increases the speed of the object will .....
  - a. decrease.
  - b. increase.
  - c. not change.
  - d. become zero.
- 7. The factor that affecting the kinetic energy of two objects when they move with the same speed, is .....
  - a. their colors.
  - b. their sound energy.
  - c. their masses.
  - d. their temperatures.







- 2. When a truck and a small car move at the same speed, the kinetic energy of the truck is ..... than that of the small car.
- 3. If the mass of a moving object decreases, its kinetic energy will ..... at the same speed.
- 4. Traveling at the same speed, a large mass vehicle causes damage ..... than a small mass vehicle during collision.
- 5. A moving train at speed 80 km/hr. causes damage ..... than a moving car at speed 80 km/hr. during collision, as the train has more ..... and ..... energy than the car.
- 6. The ..... energy depends on the speed of a moving object.
- 7. The car with speed 50 km/hr. has kinetic energy ..... than that of the truck with the same speed.
- 8. In vehicles, the ..... energy that is stored in the fuel changes into ..... energy that allows them to move.

#### 6 Give reasons for :

- 1. A truck needs a bigger engine than that of a small car to move with the same speed.  
.....
- 2. A car consumes less fuel than that in a bus.  
.....
- 3. A moving truck has kinetic energy more than that of a small moving car at the same speed.  
.....

#### 7 What happens if ... ?

- 1. The pushing force that acts on an object decreases. (according to its kinetic energy).  
.....
- 2. The speed of a moving object increases. (according to its kinetic energy).  
.....
- 3. The kinetic energy of a moving car increases.  
(according to the damage during collision).  
.....
- 4. A truck and a small car move at the same speed. (according to kinetic energy).  
.....



### 8 Read the following paragraph, then correct the underlined words :

If a truck and a car move at the same speed the kinetic energy of the truck is less than that of the car as the mass of the truck is less than that of the car.

.....

.....

.....

### 9 Look at the opposite photos, then choose the correct answer :



Motorbike



Car



Truck



Train

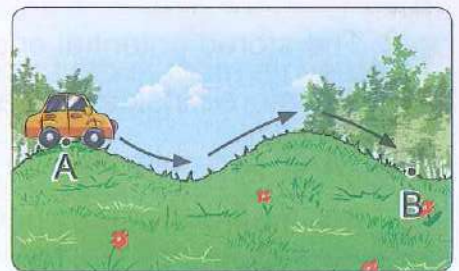
- The ..... has the biggest mass.
  - motorbike
  - car
  - truck
  - train
- If the motorbike and the train move at the same speed, the kinetic energy of the train is ..... that in the motorbike.
  - less than
  - more than
  - equal to
  - half to
- If the car, truck and motorbike move at the same speed and collide with a strong wall. Which of the following sentences is correct ? .....
  - The car causes the most damage.
  - The motorbike causes the most damage.
  - The truck causes the most damage.
  - The truck causes the least damage.
- Which one consumes more fuel, if all of them move at the same speed ? .....
  - Motorbike.
  - Car.
  - Truck.
  - Train.



## Exercises on Lesson 4

### 1 Choose the correct answer :

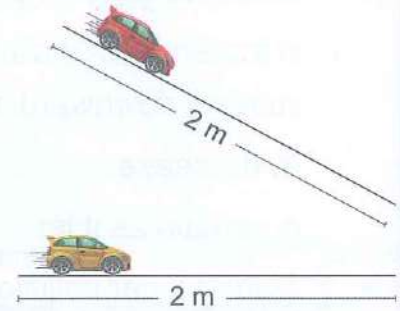
- 1. If the angle of inclination of the road increases, the kinetic energy of an object moving downward on it, will .....
  - a. decrease.
  - b. increase.
  - c. remain as it is.
  - d. be destroyed.
- 2. During a car collision, which of the following speeds is the most danger on the driver's life ? .....
  - a. 50 km/hr. on a flat road.
  - b. 50 km/hr. on an inclined road.
  - c. 100 km/hr. on a flat road.
  - d. 100 km/hr. on an inclined road.
- 3. All the following factors affect the kinetic energy of a moving car, except .....
  - a. the mass of the car.
  - b. the pushing force of the car engine.
  - c. the airbags inside the car.
  - d. the inclination of the road on which the car moves.
- 4. As the mass of a vehicle increases, it needs ..... to move so it has .....
  - a. less force – less potential energy.
  - b. more force – more potential energy.
  - c. less force – less kinetic energy.
  - d. more force – more kinetic energy.
- 5. In the opposite figure if the car moves from point (A) to point (B) , so its kinetic energy .....
  - a. increases then increases then decreases.
  - b. decreases then decreases then increases.
  - c. decreases then increases then decreases.
  - d. increases then decreases then increases.





6. The opposite figure shows two ramps of 2 meters length, if you push two toy cars that have the same mass with two equal forces at the same moment, SO .....

- both cars reach the end of the ramp at the same moment.
- the yellow car reaches the end of the ramp first.
- the red car reaches the end of the ramp first.
- the yellow car has kinetic energy larger than that of the red car.



**2 Choose from column (B) what suits it in column (A) :**

(A)	(B)
1. The mass of the object	a. affects the kinetic energy of the moving object, but doesn't affect its potential energy.
2. The height of the object from Earth's surface	b. affects both kinetic and potential energies of the object.
3. The speed of a moving object	c. when it decreases, the kinetic energy increases.
	d. when it increases, the stored potential energy increases.

1. .... 2. .... 3. ....

**3 Put (✓) or (X) :**

- Moving objects with different speeds on the Earth's surface, have the same potential energy. ( )
- The stored potential energy inside a body at 3 meters height is more than that stored inside the same body at 1 meter height. ( )
- When two objects have the same mass and move with the same speed, this means that they have different kinetic energies. ( )
- Your kinetic energy when moving on the Earth's surface is equal to your kinetic energy when moving down a ramp. ( )
- When the mass of an object increases, it need less force to move. ( )



**4 Correct the underlined words :**

1. When the inclination of a road decreases, the kinetic energy of an object moving on it downward increases. (.....)
2. Kinetic energy of an object doesn't depend on its speed , which affects its potential energy. (.....)
3. When an object moves with a very large speed, it has a small amount of kinetic energy. (.....)

**5 Complete the following sentences :**

- 1. By increasing the mass of a car that moves down a ramp, its speed will ..... , so the time it takes to cover the same distance will .....
- 2. The speed and ..... energy of a moving object on a ramp can be increased by increasing the ..... of the ramp.
- 3. By increasing the angle of inclination of a ramp, the ..... and ..... energy of a car moves down this ramp will increase.
- 4. If the angle of the ramp decreases, the speed of moving objects on it will .....
- 5. If two trucks move down a hill, the speed of a truck with mass 1 ton is ..... than that of another truck with mass 2 tons.
- 6. The kinetic energy of a moving object on a ramp with height 2 meters is ..... than that of the same object on another ramp with height 4 meters.

**6 Give reasons for :**

- 1. A car with mass = 3 tons moves down a hill reaches its bottom faster than another car with mass = 1 ton moves down the same hill.  
.....  
.....
- 2. The speed of a truck is more than that of a car when both of them move down a ramp.  
.....
- 3. The speed of a toy car on a flat surface is slower than that if it moves down on a ramp to travel the same distance.  
.....  
.....



**7 What happens if ... ?**

1. The mass of a toy car that moves down a ramp increases.

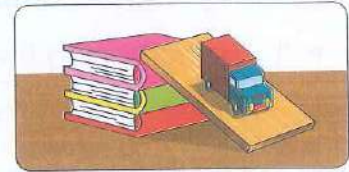
(according to the time taken to reach the end of ramp).

.....

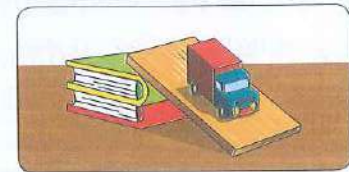
2. Increasing the angle of a bridge where a car moves down on it.

(according to the car speed).

.....

**8 Look at the opposite figures that show a toy truck moves down two different ramps, then answer the questions below :**

Ramp (A)



Ramp (B)

1. Which ramp makes the truck has the most speed ?

(Give a reason for your answer).

.....

.....

2. If there is a small toy car moves on ramp (A) beside the toy truck. Which one of them is faster, the car or the truck ?

(Give a reason for your answer).

.....

.....

3. What happens when increasing the angle of ramp (B) ?

(according to the speed of the truck).

.....

**9 On a ramp road, there are two vehicles move downward, vehicle (A) with speed 70 km/hr. of 1 ton mass, and vehicle (B) with speed 70 km/hr. of 2 tons mass. According to these information, put (✓) or (x) in front of the following sentences :**

1. Kinetic energy of vehicle (A) is equal to that of vehicle (B). ( )
2. Kinetic energy of vehicle (A) is smaller than that of vehicle (B). ( )
3. Kinetic energy of both vehicles is equal to zero. ( )
4. Mass of both vehicles, is the factor that affects their kinetic energy. ( )
5. Speed of both vehicles, doesn't affect their kinetic energy. ( )



**Exercises on Lesson 5****1 Choose the correct answer :**

- 1. During collision, the energy of the collided objects is .....
  - a. created and changed.
  - b. destroyed and transferred.
  - c. changed and transferred.
  - d. created and destroyed.
- 2. If two objects collide with each other, the energy after collision ..... the energy before collision.
  - a. triple                      b. double                      c. half                      d. equal to
- 3. In the Newton's cradle, when you move a ball away from the others and not let it go, then ..... that is stored in this ball.
  - a. your potential energy is changed into kinetic energy
  - b. your kinetic energy is changed into stored potential energy
  - c. your sound energy is changed into kinetic energy
  - d. your sound energy is changed into stored potential energy
- 4. The kinetic energy travels ..... through the balls of Newton's cradle.
  - a. in three different directions
  - b. in the same direction of movement
  - c. in two opposite directions
  - d. in the form of stored chemical energy
- 5. When two balls are pushed away at the left side of Newton's cradle, this happens as a result of collision of ..... at the right side.
  - a. one ball                      b. two balls                      c. three balls                      d. four balls
- 6. When you throw a ball of clay strongly at a wall, there is .....
  - a. no damage occurs to the ball.                      b. more damage occurs to the ball.
  - c. an energy destroyed.                      d. an energy created.
- 7. At the same speed, a large mass object has ..... than that of a small mass object.
  - a. less potential energy
  - b. more potential energy
  - c. less kinetic energy
  - d. more kinetic energy



## 2 Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Kinetic energy	a. it is the energy that reaches ear causing hearing.
2. Potential energy	b. it is the energy transferred from one ball to another, in Newton's cradle.
3. Light energy	c. it is the energy that doesn't exist in Newton's cradle during collision.
	d. it is the energy stored in the first ball of Newton's cradle when you rise it up.

1. ....

2. ....

3. ....

## 3 Put (✓) or (X) :

- 1. The moving balls in Newton's cradle will stop after lots of collisions, this means that their kinetic energy is destroyed. ( )
- 2. Some of kinetic energy is changed during collisions of balls in Newton's cradle, as sound and thermal energies. ( )
- 3. Among the forms of energy that doesn't exist in Newton's cradle during collisions, are light and chemical energies. ( )
- 4. A smaller and slower object has more kinetic energy than that of a larger and faster object. ( )

## 4 Correct the underlined words :

1. The distance that the moving balls move on the two opposite sides of the Newton's cradle, increases gradually as time passes. (.....)
2. The moving balls of the newton's cradle, keeps their kinetic energy as time passes. (.....)
3. The number of moving balls at one side of Newton's cradle must be more than that move at the other side. (.....)
4. The energy that is produced due to the friction between the string and other parts of the Newton's cradle, is the sound energy. (.....)

## 5 Complete the following sentences :

- 1. The Newton's cradle ball stores ..... energy when it is raised up without leaving it go.
- 2. The ..... energy changes into ..... energy when the Newton's cradle ball moves towards the rest of balls.



- 3. Most of ..... energy in the Newton's cradle is transferred from the first ball to the rest of balls.
- 4. When a marble hits another one, some of ..... energy changes into ..... energy which you can hear it.
- 5. During collision between the Newton's cradle balls some of ..... energy changes into ..... energy due to the ..... between the string and the other parts of the cradle.
- 6. Due to the ..... of air with Newton's cradle balls some of ..... energy changes into other forms of energy.
- 7. In Newton's cradle, when you rise up one ball it stores ..... energy, that changes into ..... energy when you leave the ball to move.
- 8. The ..... energy decreases gradually when you leave the moving balls of Newton's cradle long enough until they .....

#### 6 Give reasons for :

- 1. You can hear the sound of collision between your marbles.  
.....
- 2. The amount of energy before the collision is equal to the amount of energy after the collision.  
.....

#### 7 What happens if ... ?

- 1. The Newton's cradle ball is raised up without leaving it go.  
(according to its energy).  
.....  
.....
- 2. You leave the ball of Newton's cradle move towards the rest of balls.  
(according to the change of energy).  
.....
- 3. A friction occurs between the string and the other parts of Newton's cradle during collision.  
(according to the change of energy).  
.....



**8** Arrange the following sentences to show the steps of collision of Newton's cradle balls in the correct order.

- (.....) Kinetic energy is transferred from the first ball to the rest of balls.  
 (.....) Potential energy of the first ball decreases and changes into kinetic energy.  
 (.....) Kinetic energy of all balls decreases gradually until they stop.  
 (.....) Rise up the first ball, so it stores potential energy.

**9** Look at the opposite figure, then choose the correct answer :



- When you push the marble the ..... energy of your hand transfers to the marble.
  - sound
  - thermal
  - kinetic
  - potential
- During the collision between your moving marble and other marbles, some of ..... energy of your marble changes into ..... energy.
  - sound – kinetic
  - kinetic – sound
  - thermal – kinetic
  - sound – potential
- If you push a marble down on a ramp, the speed of the marble decreases by .....
  - decreasing the angle of the ramp.
  - increasing the angle of the ramp.
  - increasing the mass of the marble.
  - decreasing the width of the ramp.



## Exercises on Lesson 6

### 1 Choose the correct answer :

- 1. The people who work on determining the amount of damage that happens in accidents, are known as .....
  - a. doctors.
  - b. teachers.
  - c. crash investigators.
  - d. forest investigators.
- 2. "The object that is in motion continues in motion until something stops it". This statement refers to .....
  - a. laws of light.
  - b. laws of sound.
  - c. laws of adaptation.
  - d. laws of motion.
- 3. All the following factors give information about a collision between two cars, that can be used in a car crash investigation except .....
  - a. energy.
  - b. gravity.
  - c. motion.
  - d. force.
- 4. To measure the mass of a car directly, we can use .....
  - a. a thermometer.
  - b. a scale.
  - c. a mirror.
  - d. a ruler.
- 5. During an accident, the damage of a vehicle changes by changing .....
  - a. its force only.
  - b. its mass only.
  - c. both its mass and force.
  - d. both its sound and light energies.
- 6. The crash investigator can collect information about a car crash through .....
  - a. the car driver only.
  - b. the data from car manufacturers only.
  - c. videos only.
  - d. videos, car driver and car manufacturers.

### 2 Put (✓) or (X) :

- 1. A standing object still stop in its place without moving, until something moves it. ( )
- 2. Crash investigators depend only on the information about a collision that they obtain by asking the two cars drivers. ( )
- 3. Car manufacturers crash cars under controlled conditions to provide car investigators by reference materials they need. ( )
- 4. Both mass of a vehicle and its force cannot be measured directly. ( )
- 5. Comparison between car crash and manufacturers reference materials, helps investigators to know how much force was involved in the crash. ( )



**3 Correct the underlined words :**

1. As the mass of a car increases, the damage that occurs during collisions decreases. (.....)
2. Potential energy affects the degree of damage when two cars collide with each other. (.....)
3. Car tires and seabelts play an important role during accidents as they are safety equipment. (.....)

**4 Complete the following sentences :**

1. A crash investigator uses scientific laws of ..... to know the cause of the accident.
2. The crash investigators depend on ..... and ..... to get more information about the crash without blocking the road.
3. A moving object continues in ..... until something ..... it.
4. As the speed of cars increases, the damage that occurs during collisions .....

**5 Give reasons for :**

1. The crash investigators use photos and videos of cars crashes.  
.....
2. The crash investigators store the crashed cars.  
.....

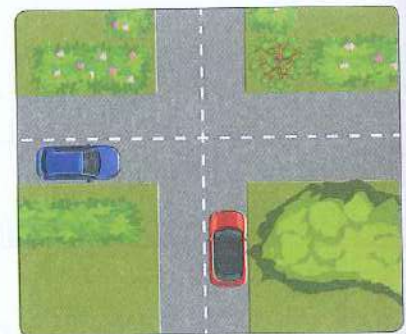
**6 Look at the opposite figure, then answer the questions below :****(A) Complete the following sentences :**

1. The speed of the blue car =

$$\frac{\text{Distance}}{\text{.....}} = \frac{500}{5} = \text{..... km/hr.}$$

2. The speed of the red car =

$$\frac{\text{.....}}{\text{.....}} = \frac{600}{5} = \text{..... km/hr.}$$

**(B) Choose the correct answer :**

1. The speed of the blue car is ..... that of the red car.

- a. more than      b. less than      c. equal to      d. double



2. According to this figure, if an accident happens between the two cars, which of the following situations may happen ? .....
- The front of the two cars will collide with each other.
  - The front of one car will collide with the back of the other car.
  - The front of one car will collide with the side of the other car.
  - The back of one car will collide with the back of the other car.

**7** Look at the opposite photo, then answer the questions below :

1. If you are a crash investigator, mention two things you can use to get more information about that accident.



.....  
 .....

2. In your opinion which one of the two vehicles causes more damage, if you know that the mass of the small car = 1 ton and the mass of the truck = 4 tons, knowing that the two vehicles move at the same speed.

.....  
 .....



Part

2

# Self-Assessments





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# Self-Assessments

on concept (2.1)

## Self-Assessment 1 On Lesson 1

1 (A) Put (✓) or (X) :

1. The engine of a normal truck is the same engine of a rocket. ( )
2. Engineers use the same idea of rocket design in stopping the shockwave truck. ( )
3. You need energy to make a force to move a chair from one place to another. ( )

(B) Give a reason for the following :

Parachutes are used in the shockwave truck and rocket.

.....  
.....

2 (A) Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Normal engine	a. is used in stopping both of the shockwave truck and rockets.
2. Jet engine	b. is used in moving a normal truck.
3. Parachute	c. is used to stop a normal truck.
	d. is used in moving the shockwave truck.

1. .... 2. .... 3. ....

(B) Which is faster, a normal truck or the shockwave truck ?  
(Give a reason for your answer).

.....  
.....

3 This figure represents one of the most powerful and fastest trucks in the world :

1. What is the name of this truck ?

.....

2. What happens if the three jet engines of this truck are replaced by the engine of a normal truck ?

.....  
.....





3. What happens if the parachutes of this truck are damaged during its motion ?

.....  
 .....

**Self-Assessment 2 till Lesson 2**

**1 (A) Choose the correct answer :**

1. The force that acts on the table to stand on the ground is ..... force.
  - a. only pulling gravity
  - b. only pushing gravity
  - c. unbalanced pushing and pulling gravity
  - d. balanced pushing and pulling gravity
2. The jet engines in the shockwave truck make it moves forward, due to the ..... acting on it.
  - a. pulling force only
  - b. pushing force only
  - c. both pulling and pushing forces
  - d. the Earth's gravity force
3. We can see all the following motions except .....
  - a. the rotation of Earth around the Sun.
  - b. a person crossing the road.
  - c. a person riding a bicycle.
  - d. a person swimming in the sea.

**(B) What happens if ... ?**

The pulling force of one of the two teams in tug-of-war game becomes greater than the other team.

.....  
 .....

**2 (A) Correct the underlined words :**

1. We can stop the motion of the shockwave truck by using fire extinguishers. (.....)
2. In tug-of-war game, the winner team is the team with the weaker force. (.....)
3. You can stop the ball that is thrown towards you by the pulling force of your hands against the ball. (.....)



**(B) Give a reason for the following :**

In the opposite figure, by increasing the number of fire extinguishers, the distance that the cart moves will increase.

.....  
 .....

**3 Look at the following figures, then choose the correct answer :**

Figure (1)



Figure (2)

- The force (s) used in figure (1) is/are .....
  - pushing force only.
  - pulling force only.
  - both pushing and pulling forces.
  - neither pushing nor pulling force.
- The force(s) used in figure (2) is/are .....
  - pushing force only.
  - pulling force only.
  - both pushing and pulling forces.
  - neither pushing nor pulling force.
- The winner group in the game of figure (2) is the group that has force ..... that of the loser team.
  - more than
  - less than
  - equal to
  - weaker than

**Self-Assessment 3 till Lesson 3**

**1 (A) Complete the following sentences :**

- There are two forces act on any object stands on a table which are ..... and .....
- You cannot lift up a bag from the ground if the pulling force of your hand and the force of gravity are .....
- When you stop pedalling during the movement of the bicycle, its speed decreases gradually until it stops, due to the effect of ..... force.



**(B) Give a reason for the following :**

When you let the ball out of your hand, it falls to the ground.

.....  
 .....

**2 (A) Put (✓) or (X) :**

1. The shockwave truck has only one jet engine that makes it faster than the normal truck. ( )
2. The reason for stopping a toy car moves on a table is the friction between the toy car and the table surface. ( )
3. To move up any object from the ground, the pulling force of your hand must be smaller than the pulling force of the gravity. ( )

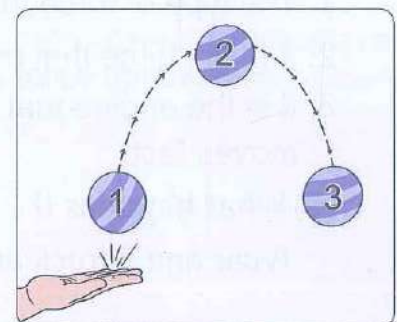
**(B) Mention two forces act on a moving car and opposes its direction of movement.**

.....  
 .....

**3 Look at the opposite figure that shows the movement of a ball pushed up with your hand, then answer the questions :**

**(A) Put (✓) or (X) :**

1. The ball moves from point (1) to point (2) due to the gravity pulling force. ( )
2. The ball moves from point (2) to point (3) due to the gravity pulling force. ( )
3. At all points, the ball is affected by the friction force of the air. ( )



**(B) Complete the following sentence :**

The ball moves from point ..... to point ..... in a direction opposite to the direction of gravity.



## Self-Assessment 4 till Lesson 4

**1 (A) Choose from column (B) what suits it in column (A) :**

(A)	(B)
1. Friction force	a. are the forces that act on any object to make it moves.
2. Balanced forces	b. is the force that act in the opposite direction of the object's movement to stop it.
3. Unbalanced forces	c. is the force that act in the same direction of the object's movement to stop it.
	d. are the forces that act on any object that does not move.

1. ....

2. ....

3. ....

**(B) Give a reason for the following :**

If a ball moves on the ground, its speed decreases till it stops.

.....  
 .....

**2 (A) Write the scientific term of each of the following :**

1. The type of force that is used in tug-of-war game. (.....)
2. It is the force that causes any object falls down toward the ground.(.....)
3. It is the engine that is used in the shockwave truck to allow it moves fast. (.....)

**(B) What happens if ... ?**

A car and a truck are affected by the same pushing force.

.....  
 .....

**3 Look at this picture, then complete the following sentences :**

1. The car moves as a result of ..... force that is applied by the boy.
2. During the movement of the car, it is opposed by a friction force of ..... and a friction force of .....
3. The friction force ..... the speed of the car.





4. If the car is pushed by a stronger force, it will move for a ..... distance.
5. If this car is replaced by a bigger one, it will need a ..... pushing force to move the same distance.

### Self-Assessment 5 till Lesson 5

#### 1 (A) Choose the correct answer :

1. When one of two toy cars moves faster than the other, this means that this toy car do work ..... that of the other toy car.
  - a. more than
  - b. less than
  - c. equal to
  - d. half to
2. The reason for stopping a toy car craches the wall is the .....
  - a. pushing force of wall in the opposite direction of the car movement.
  - b. pushing force of wall in the same direction of the car movement.
  - c. pulling force of wall in the opposite direction of the car movement.
  - d. pulling force of wall in the same direction of the car movement.
3. In tug-of-war game, if the first group contains three children, while the second group contains nine children, this means that the forces act on the rope are ..... of each other.
  - a. balanced in opposite direction
  - b. unbalanced in opposite direction
  - c. balanced in the same direction
  - d. unbalanced in the same direction

#### (B) Give a reason for the following :

Any body moves on the ground is usually affected by a force opposes its direction of movement.

.....

.....

#### 2 (A) Correct the underlined words :

1. The reason for standing of a cup on a table is that the pushing force of the table is more than the pulling force of gravity. (.....)
2. The work done by the football is always less than the amount of energy transferred from the player foot to the ball. (.....)
3. If the same force is applied on a large ball and a small ball, the large ball moves a distance longer than the small ball. (.....)

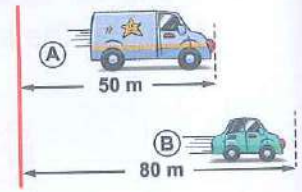


**(B) In the opposite figure, if we affect on these two toy cars by the same force :**

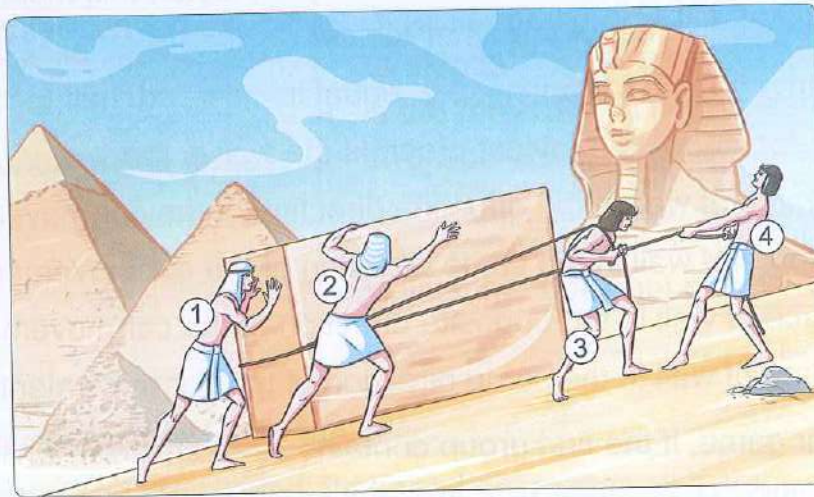
Why the car (B) moves for a longer distance than the car (A) ?

.....

.....



**3 The pharaohs built the pyramids, and this work took many years of work :**



**(A) Find out from the picture :**

1. Two persons pull the heavy stone. (.....)
2. Two persons push the heavy stone. (.....)
3. The type of force between the stone and the ground. (.....)

**(B) Put (✓) or (X) :**

1. If the large stone moves from its place, this means that there are balanced forces acting on it. ( )
2. Big stones need more force to move them than smaller ones. ( )
3. The work done is equal to the amount of energy transferred by a force that is used to move the stone. ( )



# Model Exam

on concept (2.1)

Total mark

20

## 1 (A) Choose the correct answer :

(5 marks)

1. What force do you use to kick a ball with your leg ? .....  
a. Pull.                      b. Push.                      c. Sound.                      d. Light.
2. When an object is in motion, this means that its ..... changes.  
a. color                      b. shape                      c. size                      d. position
3. Which of the following will cause an object to move ? .....  
a. Balanced forces.                      b. Unbalanced forces.  
c. Sound energy.                      d. Light energy.
4. Which sentence represents the best example of gravity ? .....  
a. A car hits a tree, and its motion stops.  
b. A wind blows, and a sailboat moves.  
c. A book is pushed, and it moves across a table.  
d. A person drops a ball, and it falls to the ground.

## (B) What happens if ... ?

The shockwave driver opens the parachutes.

.....  
.....

## 2 (A) Put (✓) or (X) :

(5 marks)

1. Lifting a book upward needs more energy than pushing a truck. ( )
2. You need energy to push a car forward or backward. ( )
3. Using a remote control of television needs a pushing force that acts on its buttons. ( )
4. When a car carshes into a wall, it will not stop. ( )

## (B) Give a reason for the following :

The shockwave truck is faster than the normal truck.

.....  
.....

## 3 (A) Complete the following sentences :

(5 marks)

1. The work done by a basketball is equal to the amount of ..... transferred from the player hand to the ball.
2. If the same pulling force acts on two boxes, and one of them is larger than the other, the smaller box will move for a ..... distance.



- When you lift up an object from the ground, there are two forces act on it, which are the ..... force of your hand and ..... force of the gravity.
- We can say that the object is in motion relative to a ..... point.

**(B) The following figure shows two similar toy cars, study the figure then answer the questions below :**

**Which of these two cars is affected by a greater force ?**

**(Give a reason for your answer).**

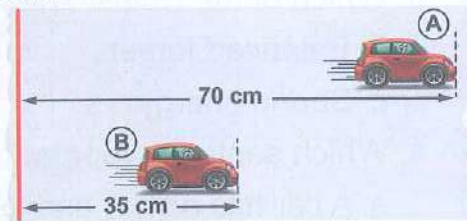
.....

.....

.....

.....

Original position



**4 (A) Write the scientific term of each of the following :**

**(5 marks)**

- A force that you make to change the direction of an object towards you. (.....)
- A force that you make to change the direction of an object away from you. (.....)
- It is a push or pull that is applied to an object causes it to change its position. (.....)
- It is a force that is exerted when objects rub against each other. (.....)

**(B) Look at the opposite figure, then answer the following question :**

In the opposite figure what happens if we increase the number of fire extinguishers fixed on the cart.

.....

.....

.....





# Self-Assessments

on concept (2.2)

## Self-Assessment 6 on Lesson 1

### 1 (A) Choose the correct answer :

1. An electric fan produces ..... energy.  
a. chemical      b. electrical      c. mechanical      d. thermal
2. When switching on an electric lamp, it produces ..... energies.  
a. sound and light      b. kinetic and light  
c. chemical and light      d. light and thermal
3. The kinetic energy of a car increases by .....  
a. decreasing its speed.  
b. increasing its speed.  
c. keeping its speed without changing.  
d. decreasing the pushing force acts on it.

### (B) What happens if ... ?

A roller coaster moves from up to down. (according to the change of energy).

.....

### 2 (A) Put (✓) or (X) :

1. When you supply a television with electricity, you obtain sound and light energies. ( )
2. Electric lamp, fires and the moon all produce thermal energy. ( )
3. Food and car battery are similar, as both of them stores chemical energy. ( )

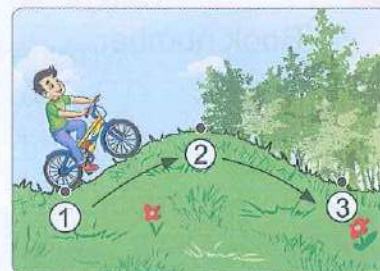
### (B) Give a reason for the following :

A sand surfer moves very fast down the sand slope. (according to the change of energy).

.....

### 3 Look at the following figure, then complete the following sentences :

1. The bicycle stores energy when it moves from point ..... to point .....
2. The speed of the bicycle increases when it moves from point ..... to point .....
3. The ..... energy of the bicycle will ..... by increasing its speed.





## Self-Assessment 7 till Lesson 2

### 1 (A) Choose the correct answer :

1. You do work in all the following situations except .....
  - a. pushing a wooden box for a distance.
  - b. throwing a stone for a distance.
  - c. lifting a bag up for a distance.
  - d. pulling a big tree which doesn't move.
2. A flying airplane in the sky, has .....
  - a. potential energy only.
  - b. kinetic energy only.
  - c. both potential and kinetic energies.
  - d. neither kinetic nor potential energies.
3. You can see all following, except .....
 

a. the light of the Sun.	b. the reflected light of the moon.
c. the light of the candle.	d. the sound of a radio.

### (B) Give a reason for the following :

When a tennis ball is thrown upwards, its potential energy increases.

.....

### 2 (A) Put (✓) or (X) :

1. The only form of energy that you need to see objects is the sound energy. ( )
2. Work is a force that causes an object to move a distance. ( )
3. You do no work, if you push a wall that doesn't move. ( )

### (B) What happens if ... ?

A ball falls from your hand towards the ground. (according to the change of energy).

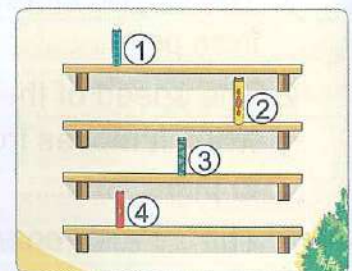
.....

### 3 Look at the opposite figure, then choose the correct answer :

1. Book number ..... has the most potential energy.
 

a. (1)	b. (2)
c. (3)	d. (4)
2. Book number ..... has the least potential energy.
 

a. (1)	b. (2)
c. (3)	d. (4)





3. Book number (2) has potential energy more than that of .....
- a. book number (3) only.                      b. book number (4) only.  
c. books number (1) and (3).                d. books number (3) and (4).
4. Book number (3) has potential energy less than that of .....
- a. book number (4) only.                      b. book number (2) only.  
c. books number (1) and (2).                d. books number (2) and (4).

### Self-Assessment 8 till Lesson 3

#### 1 (A) Choose the correct answer :

1. The stored energy in the car battery can be changed into all following forms of energy except .....
- a. sound energy.                                      b. electrical energy.  
c. chemical energy.                                  d. mechanical energy.
2. The bird that stops without moving on a high tree has .....
- a. potential energy only.  
b. kinetic energy only.  
c. both potential and kinetic energies.  
d. neither potential nor kinetic energies.
3. When you release a compressed spring, its stored potential energy will .....
- a. change into chemical energy.  
b. change into kinetic energy.  
c. change into thermal energy.  
d. remain as it is.

#### (B) Give a reason for the following :

Potential energy has different forms.

.....  
.....

#### 2 (A) Put (✓) or (X) :

1. Some forms of energy can be created and also can be destroyed.                      (    )  
2. There is only one form of energy, which is the potential energy.                      (    )  
3. A battery of a car stores electrical energy.    (    )

#### (B) What happens if ... ?

A ball moves down along a slide.                      (according to the change of energy).

.....



**3 You have three devices (A) , (B) and (C) , if you know that :**

- Device (A) changes chemical energy into light and thermal energies.
- Device (B) changes electrical energy into kinetic energy.
- Device (C) changes chemical energy into thermal energy.

**Choose correct answer :**

1. Device (A) may be .....
 

a. a flashlight.	b. a television.
c. an electric heater.	d. a radio.
2. Device (B) may be .....
 

a. an electric heater.	b. an electric lamp.
c. an electric fan.	d. a radio.
3. Device (C) may be .....
 

a. a gas oven.	b. an electric fan.
c. an electric mixer.	d. a radio.

**Self-Assessment 9 till Lesson 4****1 (A) Choose the correct answer :**

1. Both food and gasoline, .....
 

a. store mechanical energy.	b. store chemical energy.
c. produce chemical potential energy.	d. produce electrical potential energy.
2. Both radio and television are .....
 

a. operated by gravitational energy.	b. operated by mechanical energy.
c. produce sound energy.	d. produce chemical energy.
3. Electric heater produces ..... energy.
 

a. electrical	b. sound	c. thermal	d. light
---------------	----------	------------	----------

**(B) Give a reason for the following :**

If the internal combustion engine don't burn the gasoline, the car can't move.

.....

.....



**2 (A) Put (✓) or (X) :**

- The energies produced from television are sound and light. ( )
- There are some forms of energy, that can be destroyed. ( )
- The car engine can transform mechanical energy into light energy. ( )

**(B) What happens if ... ?**

Gasoline burns in the internal combustion engine of a car.

(according to the change of energy).

.....  
 .....

**3 Look at the following figure, then choose the correct answer :**

- Wires inside the flashlight have ..... energy.
  - sound
  - light
  - electrical
  - chemical
- Which part inside the flashlight stores chemical energy ? .....
  - Battery.
  - Wires.
  - Lamp.
  - Its body.
- Which form of energy in the flashlight you can see ? .....
  - Electrical energy.
  - Light energy.
  - Thermal energy.
  - Chemical energy.



### Self-Assessment 10 till Lesson 5

**1 (A) Choose the correct answer :**

- When the ice-skater stops on the ice without moving, so he has .....
  - the most kinetic energy.
  - no kinetic energy.
  - the most potential energy.
  - the least light energy.
- All the following forms of energy do not affect the movement of an ice-skater, except .....
  - sound energy.
  - light energy.
  - electric energy.
  - kinetic energy.
- The most potential energy stored in the skater's body, is that when he is .....
  - skating on ice.
  - at the top of his jump.
  - standing without movement.
  - at the bottom of his jump.



**(B) Give a reason for the following :**

A skater moves back down to the ice after he reaches the highest point in the air.

.....

.....

**2 (A) Put (✓) or (X) :**

- Kinetic energy of a skater is transferred to another skater if he pushes the other skater. ( )
- The skater has the least kinetic energy, when he starts jumping through the air. ( )
- The kinetic energy in the skater's body changes into potential energy, when the skater begins to skate. ( )

**(B) What happens if ... ?**

A ball at 50 meters height from the ground starts to move down.

(according to the change of energy).

.....

.....

**3 Look at the opposite figure, then choose the correct answer :**

1. The ball number..... has the most potential energy.

- a. 1                      b. 2                      c. 3                      d. 4

2. When the ball number ① moves up from its position to the position of ball ②, so its .....

- potential energy changes into kinetic energy.
- kinetic energy changes into potential energy.
- potential energy becomes zero.
- kinetic energy doesn't change.

3. When the ball number ③ moves down from its position to the position of ball ④, so its .....

- kinetic energy changes into potential energy.
- kinetic energy doesn't change.
- potential energy doesn't change.
- potential energy changes into kinetic energy.





# Model Exam

on concept (2.2)

Total mark

20

## 1 (A) Choose the correct answer :

(5 marks)

- When an object moves down a ramp, its stored energy .....
  - increases.
  - doesn't change.
  - changes to a less active form of energy.
  - changes to a more active form of energy.
- All the following energies cannot be seen, except .....
  - thermal energy.
  - electrical energy.
  - light energy.
  - sound energy.
- All the following examples store chemical energy, except .....
  - food.
  - natural gas.
  - a battery.
  - a compressed spring.
- When the ice-skater jumps high, the force affecting the skater must be .....
  - balanced.
  - unbalanced.
  - created.
  - destroyed.

## (B) Give a reason for the following :

Both the Sun and electric lamp produce two forms of energy.

.....

## 2 (A) Put (✓) or (X) :

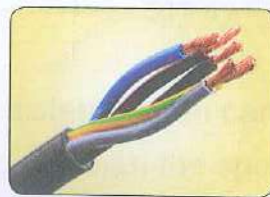
(5 marks)

- The moving objects only have energy, while the objects that don't move have no energy. ( )
- To do work, you must push or pull an object to a certain distance. ( )
- Light waves is a form of potential energy. ( )
- Orange, potato and car battery contain stored chemical energy. ( )

## (B) Complete the following sentences below pictures :



changes  
into



changes  
into



1. Batteries inside the radio store ..... potential energy.

2. .... energy in the wires inside the radio.

3. .... energy produced from the radio speaker.



**3 (A) Correct the underlined words :****(5 marks)**

1. When an object moves down, it has more active form of energy known as potential energy. (.....)
2. Sound energy is used in cooking food. (.....)
3. A car battery stores a form of kinetic energy known as chemical energy. (.....)
4. Gasoline contains electric potential energy. (.....)

**(B) What happens if ... ?**

If a stopped ball at the top of a slope starts to move down.

(according to the change of its energy)

.....  
 .....

**4 (A) Write the scientific term of each of the following :****(5 marks)**

1. The form of energy that the object has due its movement. (.....)
2. The energy that is used to operate all electric devices. (.....)
3. It is the stored potential energy in a compressed spring. (.....)
4. The energy that is stored in both the human food and car fuel. (.....)

**(B) Cross out the odd word :**

1. Sound energy – Light energy – Thermal energy – Chemical energy. (.....)
2. Radio – Electric fan – Washing machine – Electric mixer. (.....)



# Self-Assessments

on concept (2.3)

## Self-Assessment 11 On Lesson 1

### 1 (A) Put (✓) or (x) :

1. The speed is measured in kilogram per hour because it depends on the distance and time. ( )
2. The fastest speed that a horse can reach is equal to that of a cheetah. ( )
3. Cheetah has a large oversized heart to give it the enough power to run fast. ( )

### (B) What happens if ... ?

The nose of cheetah has narrow openings.

.....

### 2 (A) Write the scientific term of each of the following :

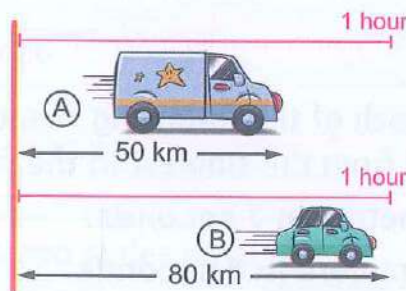
1. It is one of the measuring units of speed. (.....)
2. The organ that allows the cheetah to breathe a lot of air. (.....)
3. The part of cheetah's body that act as a spring for its leg muscles. (.....)

### (B) Mention two physical characteristics that make cheetah is the fastest land animal on the Earth.

.....

.....

### 3 Look at the following figure, then complete the sentences below :



1. Car (A) covered a ..... distance than car (B).
2. The speed of car (B) is ..... than the speed of car (A).
3. The speed of car (A) is ..... than the speed of a runner.
4. If car (A) and car (B) cover the same distance in the same time, so both of them have equal .....



## Self-Assessment 12 till Lesson 2

### 1 (A) Choose the correct answer :

1. Which of the following moving objects has the highest speed ? .....  
 a. Horse.                      b. Airplane.                      c. Runner.                      d. Bicycle.
2. The organ that helps cheetah to breath a lot amount of air is the .....  
 a. ear.                      b. leg.                      c. nose.                      d. heart.
3. If a bicycle travels 30 meters in 5 seconds, so its speed equals .....  
 a. 6 km/hr.                      b. 3 km/hr.                      c. 7 m/sec.                      d. 6 m/sec.

### (B) What happens if ... ?

An object moves a longer distance in a shorter time.      (according to its speed)

.....

.....

### 2 (A) Correct the underlined words :

1. To calculate the speed of any object we must divide the distance it travels by the length it takes to travel that distance.      (      )
2. The fastest land animal in our world is the horse.      (      )
3. The object that travels the same distance in larger amount of time is moving at a greater speed.      (      )

### (B) Give a reason for the following :

To know the speed of an object you need to know the covered distance by this object and the time taken to cover this distance.

.....

.....

### 3 Calculate the speed of each of the following runners, then arrange them according to their speed from the slowest to the fastest :

- Runner (A) covers 3 meters in 3 seconds.
- Runner (B) covers 24 meters in 8 seconds.
- Runner (C) covers 10 meters in 5 seconds.

1. Speed of runner (A) = ..... ÷ ..... = ..... m/sec.

2. Speed of runner (B) = ..... ÷ ..... = ..... m/sec.

3. Speed of runner (C) = ..... ÷ ..... = ..... m/sec.

4. The arrangement is :

Runner (.....) → Runner (.....) → Runner (.....)



**Self-Assessment 13 till Lesson 3**

**1 (A) Complete the following sentences :**

1. To calculate the speed of a body that moves down a ramp, we need to know the ..... of the ramp and the ..... taken to reach the end point of this ramp.
2. The cheetah is considered as the fastest land animal because it can travel longer ..... in a short period of .....
3. If you walk from your school to your house, you will take a ..... time than if you ride a bicycle to travel the same distance.

**(B) Give a reason for the following :**

When we decrease the height of the ramp, the speed of a toy car moving down it will decrease.

.....  
 .....

**2 (A) Put (✓) or (X) :**

1. The rocket is faster than the airplane. ( )
2. The leg is the flexible part in the cheetah's body that makes it moves faster. ( )
3. The object that moves down a ramp has more speed than that if it moves on a flat road. ( )

**(B) What happens if ... ?**

A car moves on a ramp road. (according to its speed).

.....  
 .....

**3 The opposite figure shows two slides have the same distance (length).**

If you know that the mass of the girl is 50 kilograms and the mass of the boy is 60 kilograms.

1. Which one can reach the end of the slide first (Give a reason for your answer).



.....  
 .....







**3** Look at the following figures, then complete the following sentences :



Animal (A)



Animal (B)

1. The animal that can reach the highest speed when it moves down a hill is animal .....
2. Animal ..... is considered as one of the species of animal .....
3. The speed of animal ..... is more than the speed of animal .....

**Self-Assessment 15 till Lesson 5**

**1** (A) Choose from column (B) what suits it in column (A) :

(A)	(B)
1. Speed	a. is changed into kinetic energy in the car engine.
2. Kinetic energy	b. is decreased by increasing the speed.
3. Potential energy	c. is increased by increasing the speed.
	d. is measured by dividing the distance over the time.

1. ....

2. ....

3. ....

**(B) Give a reason for the following :**

If a driver takes his foot of the gas pedal, the car starts to stop gradually.

.....

.....

**2** (A) Put (✓) or (X) :

1. When the driver presses the gas pedal, the speed of the car decreases gradually until it stops. ( )
2. The smooth ramp makes the moving object moves slower than the rough ramp. ( )
3. By increasing the angle of inclination of a ramp, the speed of an object moves on it will increase. ( )



(B) What happens if the chemical potential energy in the gasoline is converted into kinetic energy in the car engine ?

.....  
.....  
.....

3 A driver drives a car, and it moves for a distance 200 kilometers in two hours. Choose the correct answer :

- The speed of the car is .....
  - 100 km/hr.
  - 100 m/sec.
  - 50 km/hr.
  - 50 m/sec.
- If the driver wants to increase the speed of the car he will .....
  - press the gas pedal.
  - take off his foot from the gas pedal.
  - use the car brakes to stop the car.
  - take off the seatbelts.
- If the driver wants to decrease the speed of the car, he takes his foot off the gas pedal to decrease the ..... energy.
  - potential
  - sound
  - kinetic
  - light

**Self-Assessment 16 till Lesson 6**

1 (A) Complete the following sentences :

- We cannot measure the speed of a solar vehicle during driving, because it doesn't have .....
- In the solar vehicle, the light energy of the Sun is converted into ..... energy that allows the car to move.
- If a driver wants to go faster, he should press the gas pedal to increase the ..... of the car that in turn increases its ..... energy.

(B) What happens if ... ?

The kinetic energy of a moving car is decreased. (according to its speed).

.....  
.....  
.....



**2 (A) Write the scientific term of each of the following :**

1. The energy that increases by increasing the speed of a moving object. ( ..... )
2. The type of cars that uses the sunlight to be operated. ( ..... )
3. The stored energy in the fuel of the car that is converted to kinetic energy in its engine. ( ..... )

**(B) Calculate the speed of a solar vehicle, if you know that it covers a distance equals 240 kilometers in time between 2 O'clock and 6 O'clock.**

- The time taken to cover that distance = 6 - ..... = ..... hours.
- The speed of the solar vehicle =  $\frac{\text{.....}}{\text{.....}}$  =  $\frac{\text{.....}}{\text{.....}}$  = ..... km/hr.

**3 Look at the following figures, then complete the sentences below :**



Car (A)



Car (B)

1. Car ..... use the sunlight to get the needed energy to move, while car ..... get the needed energy from gasoline.
2. Car ..... can reach speed more than car .....
3. The speedometer that is found in car ..... shows us its speed.



# Model Exam

on concept (2.3)

Total mark

20

## 1 (A) Complete the following sentences :

(5 marks)

1. The speed of ..... vehicles is slower than that of normal vehicles and ..... vehicles.
2. The speed of two objects are equal, if they cover the same ..... at the same amount of .....
3. If two balls hit two paper cups with different forces, the farther the cup moves after hitting has more ..... energy.
4. The train can reach 96.5 kph in a time ..... than that of the cheetah.

## (B) What happens if ... ?

We decrease the speed of a moving bicycle.

(according to the kinetic energy of the bicycle).

.....  
.....

## 2 (A) Correct the underlined words :

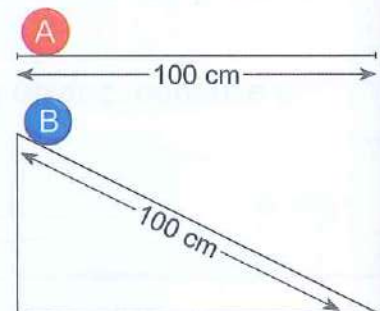
(5 marks)

1. If a bird flies for a distance = 100 kilometers in 4 hours so, its speed = 50 m/sec. (.....)
2. Energy = Distance ÷ Time. (.....)
3. The friction between the car's windows and the road decreases the speed of the car. (.....)
4. Increasing the weight of solar vehicles causes the increasing of its speed. (.....)

(B) In the opposite figure, if you push two similar balls with two equal forces on two similar surfaces have the same length which is 100 cm.

Which ball will reach the end point of the surface in shorter time. (Give a reason for your choice)

.....  
.....  
.....



## 3 (A) Choose the correct answer :

(5 marks)

1. All of the following factors affect the speed of an object on a ramp except .....
  - a. the mass of the object.
  - b. the type of the ramp's surface.
  - c. the friction between the object and the ramp's surface.
  - d. the color of the object.



2. Speed measures the distance that an object travels over .....
  - a. time.
  - b. size.
  - c. volume.
  - d. mass.
3. If we stop pedaling, the bicycle begins to .....
  - a. slow down.
  - b. speed up.
  - c. change its direction.
  - d. change its mass.
4. The speed of an object is measured in ..... or meters per second.
  - a. kilograms per hour
  - b. grams per second
  - c. kilometers per hour
  - d. kilograms per kilometers

**(B) Give a reason for the following :**

The head of the cheetah is low to its shoulder.

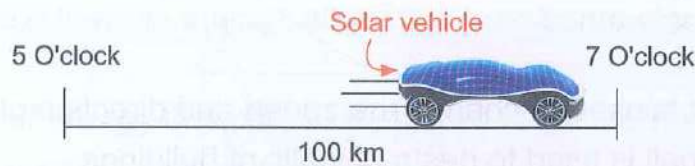
.....  
 .....

**4 (A) Put (✓) or (X) :**

(5 marks)

1. Electric vehicles have batteries that must be charged. ( )
2. By changing the height of the ramp, the speed of a ball moves on it changes. ( )
3. Cheetah's head is flexible and acts like a spring for its leg muscles. ( )
4. If two objects cover the same distance in the same time so, they have the same speed. ( )

**(B)**



The opposite figure shows a solar vehicle travels a distance of 100 km. between 5 O'clock and 7 O'clock. Calculate the speed of this solar vehicle.

- The time taken = 7 - ..... = .....

- The speed of solar vehicle =  $\frac{\text{.....}}{\text{Time}} = \frac{\text{.....}}{\text{.....}} = \text{.....}$



# Self-Assessments

on concept (2.4)

## Self-Assessment 17 on Lesson 1

### 1 (A) Choose the correct answer :

1. When a fast car hits a very big stone that doesn't move, all the following situations may happen except .....
  - a. the speed of the car becomes zero and it will stop.
  - b. the energy of the car transfers to the stone.
  - c. the airbags are inflated and filled with a gas.
  - d. the car keeps moving and its speed increases.
2. The safety equipment used in cars to absorb the cars energy during collisions includes .....
  - a. airbags only.
  - b. seatbelts only.
  - c. airbags and seatbelts.
  - d. car tires and steering wheel.
3. During collision, all the following situations may occur to the speed of the crashed cars, except it will .....
  - a. increase.
  - b. decrease.
  - c. become zero.
  - d. remain as it is.

### (B) Give a reason for the following :

After collision, the airbags deflate through their holes as fast as they inflate.

.....  
.....

### 2 (A) Put (✓) or (X) :

1. The cricket bat is used to change the speed and direction of the ball. ( )
2. The wrecking ball is used to destruct walls of buildings. ( )
3. Transferring kinetic energy occurs only from moving object to an object that doesn't move, when they collide together. ( )

### (B) What happens if ... ?

The sensors of the car airbags feel a strong crash with the car's body.

.....  
.....

### 3 Complete the following paragraph using the words below :

(different – kinetic – car – bicycle)

When a moving car collides with a bicycle, the car transfers its ..... energy to the bicycle, so the bicycle moves in ..... direction and the ..... has been more damaged than the .....



**Self-Assessment 18 till Lesson 2**

**1 (A) Choose the correct answer :**

- All the following things are used to move cars, except .....
  - gasoline.
  - food.
  - electricity.
  - solar energy.
- If a car carries a heavy mass, the driver must move ..... to avoid damages of collisions.
  - with a slow speed
  - with a high speed
  - with a low potential energy
  - with a high potential energy
- When a fast moving truck collide with a slow moving small car, some of the kinetic energy of the truck .....
  - is transformed into light energy.
  - is transformed into solar and chemical energies.
  - is transferred as kinetic energy to the small car.
  - is destroyed and no longer be existed.

**(B) Give a reason for the following :**

During running, a rabbit has kinetic energy more than that of a tortoise.

.....

**2 (A) Put (✓) or (X) :**

- You can create a thermal energy, when you burn some pieces of wood. ( )
- The only form of energy that cannot be stored is the thermal energy. ( )
- If a collision happens between two light and slow objects that move in the same direction, a small amount of damage is occurred. ( )

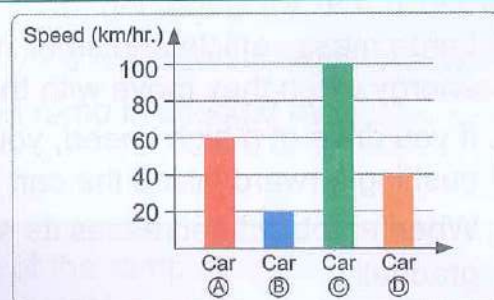
**(B) What happens if ... ?**

The speed of a moving object increases. (according to its kinetic energy).

.....

**3 Look at the opposite graph, then choose the correct answer :**

- Which car has the most kinetic energy ? .....
  - A
  - B
  - C
  - D





2. Car (D) has kinetic energy more than car .....  
 a. A                      b. B                      c. C                      d. D
3. If a collision occurs between car ..... and a wall , it will cause the most damage.  
 a. A                      b. B                      c. C                      d. D
4. If a collision occurs between car ..... and a wall, it will cause the least damage.  
 a. A                      b. B                      c. C                      d. D

### Self-Assessment 19 till Lesson 3

#### 1 (A) Choose the correct answer :

1. If there is a collision between two large masses objects at a high speeds, and another collision between two small masses objects at a low speeds, so .....  
 a. both collisions don't cause any damage.  
 b. both collisions cause the same amount of damage.  
 c. the first collision causes more damage than the second collision.  
 d. the first collision causes less damage than the second collision.
2. The energy from the burning fuel in an engine, .....  
 a. is converted into chemical potential energy.  
 b. doesn't convert into any other form of energy.  
 c. is converted into kinetic energy.  
 d. is converted into gravitational potential energy.
3. If a moving car makes a collision, which of the following speeds causes the lowest amount of damage to that car ? .....  
 a. 60 km/hr.            b. 75 km/hr.            c. 80 km/hr.            d. 50 km/hr.

#### (B) Give a reason for the following :

If two vehicles moves at the same speed, the vehicle with a large mass causes more damage than the vehicle with a small mass during collision.

.....  
 .....

#### 2 (A) Put (✓) or (X) :

1. Large mass vehicle and small mass vehicle, have the same kinetic energy when they move with the same speed. ( )
2. If you drive at a high speed, you have to stop gradually to avoid pushing forward inside the car. ( )
3. When an object decreases its speed gradually, so its kinetic energy decreases gradually. ( )



**(B) What happens if ... ?**

The mass of a moving object increases. (according to its kinetic energy).

.....

**3 Look at the opposite photos, then choose the correct answer :**

Train speed = 90 km/hr.



Truck speed = 90 km/hr.

- Kinetic energy of the train is ..... that of the truck.
  - less than
  - more than
  - equal to
  - half to
- During collision, the train causes more damage than the truck as it has ..... the truck.
  - more mass than
  - less mass than
  - equal mass as
  - half the mass of
- All the following sentences are correct except .....
  - the train has the most mass.
  - the train and the truck have the same speed.
  - the truck has the most mass.
  - the truck has the least kinetic energy.

**Self-Assessment 20 till Lesson 4**

**1 (A) Choose the correct answer :**

- A wooden box that doesn't move, gains the largest amount of kinetic energy when a moving car with a speed equals ..... hits this box.
  - 30 km/hr.
  - 50 km/hr.
  - 80 km/hr.
  - 120 km/hr.
- As the angle of the ramp increases, the kinetic energy of an object moving downward this ramp will .....
  - increase.
  - decrease.
  - remain as it is.
  - change into light energy.
- The kinetic energy of a moving car down a ramp is affected by .....
  - the mass of the car only.
  - the angle of the ramp only.
  - both the mass of the car and the angle of the ramp.
  - both the mass and color of the car.



**(B) Give a reason for the following :**

The kinetic energy of an object that moves down a ramp increases by increasing the angle of the ramp.

.....

.....

**2 (A) Put (✓) or (X) :**

- Objects of the same masses that moves with different speeds, have the same amount of kinetic energy. ( )
- As the angle of inclination of a ramp increases, the kinetic energy of an object moves on it upward decreases. ( )
- When a vehicle with a high amount of kinetic energy collide with a standing person, the vehicle pushes the person for a long distance. ( )

**(B) What happens if ... ?**

Increasing the mass of an object that moves down a ramp.

(according to the kinetic energy of the object).

.....

**3 If there are two toy cars (A) and (B) with different masses and move down on the same ramp with length 6 meters.**

Choose the correct answer :

- Car (A) travels the ramp in 3 seconds, so its speed = .....  
 a. 2 km/hr.      b. 2 m/sec.      c. 6 km/hr.      d. 3 m/sec.
- Car (B) travels the same distance in 6 seconds, so its speed = .....  
 a. 1 km/hr.      b. 3 m/sec.      c. 6 km/hr.      d. 1 m/sec.
- From the previous results, you can find out that .....  
 a. the speed of car (A) is more than that of car (B).  
 b. the speed of car (A) is less than that of car (B).  
 c. both cars have the same speed.  
 d. the speed of both cars is equal to zero.
- In your opinion, which of the following sentences may be correct ? .....  
 a. Mass of car (A) = 40 grams, mass of car (B) = 80 grams.  
 b. Mass of car (A) = 80 grams, mass of car (B) = 40 grams.  
 c. Mass of car (A) = mass of car (B) = 40 grams.  
 d. Mass of car (A) = mass of car (B) = 80 grams.



## Self-Assessment 21 till Lesson 5

### 1 (A) Choose the correct answer :

1. After collision, the distance that the last ball move on the other side of the Newton's cradle, depends on .....
  - a. the stored sound energy in it.
  - b. the stored kinetic energy in it.
  - c. the kinetic energy that is transferred from the previous balls.
  - d. the electrical energy that is transferred from the previous balls.
2. Collision of two moving cars at high speeds and move in the opposite direction, is ..... that when they are in the same direction.
  - a. not dangerous as
  - b. equal in danger as
  - c. less dangerous than
  - d. more dangerous than
3. .... are two forms of energy that exist in the Newton's cradle during collisions.
  - a. Kinetic energy and chemical energy
  - b. Potential energy and light energy
  - c. Kinetic energy and potential energy
  - d. Chemical energy and light energy

### (B) Give a reason for the following :

A sound can be heard during the collision between the Newton's cradle balls.

.....

### 2 (A) Put (✓) or (x) :

1. When you raise up a ball in the Newton's cradle, it stores thermal energy. ( )
2. In Newton's cradle as the height of the raised ball increases, it stores more potential energy. ( )
3. In Newton's cradle as the amount of the kinetic energy increases, the moving distance of the balls increases. ( )

### (B) What happens if ... ?

You leave the moving balls of the Newton's cradle move for a long time.

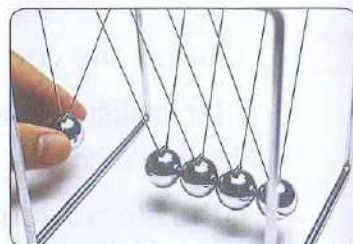
(according to their energy).

.....



**3 Look at the opposite figure, then choose the correct answer :**

- When the Newton's cradle ball is raised up without leaving it go, its ..... energy is maximum and its ..... energy equals zero.
  - kinetic – potential
  - potential – kinetic
  - kinetic – sound
  - kinetic – thermal
- When you leave the ball moves in the direction of the rest of balls some of kinetic energy of this ball changes into ..... and ..... energies.
  - sound – electrical
  - thermal – kinetic
  - kinetic – sound
  - sound – thermal

**Self-Assessment 22 till Lesson 6****1 (A) Choose the correct answer :**

- A glass window doesn't damage if ..... collides with it.
  - an iron ball
  - a wooden ball
  - a stone
  - a light beam
- As the mass and speed of a vehicle increase, all the following situations may happen during its collision except .....
  - the car would be more damaged.
  - the car would be less damaged.
  - the driver's life is endangered.
  - the damages of the car could not be repaired.
- When two cars with low speeds and move in the same direction collide with each other, this causes a damage ..... that when two cars with high speeds and move in the oppsite direction collide with each other.
  - more than
  - equal to
  - less than
  - double than

**(B) Give a reason for the following :**

Traffic cameras on different roads are important for crash investigators.

.....

.....

**2 (A) Put (✓) or (X) :**

- Car craches prove that energy can be destroyed. ( )
- The car driver can avoid accidents, when he moves with a slow speed. ( )
- Crash investigators can depend only on the reference materials that the car manufacturers supply. ( )



**(B) Mention two tasks for the crash investigator.**

.....

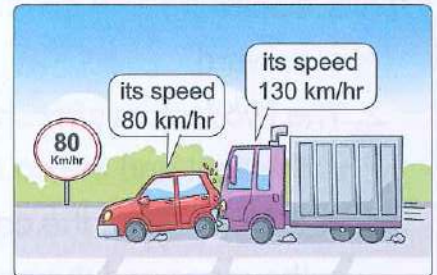
.....

.....

**3 Observe the opposite figure carefully, then answer the following question.**

In your opinion, which vehicle is the main reason that causes this accident ?

(Give a reason for your answer).



.....

.....

.....



# Model Exam

on concept (2.4)

Total mark

20

## 1 (A) Choose the correct answer :

(5 marks)

- When a car stops suddenly, the passengers move .....
  - backward.
  - downward.
  - upward.
  - forward.
- The two factors affecting the kinetic energy of an object are ..... of this object.
  - the light and the sound energies
  - the mass and the color
  - the mass and the speed
  - the speed and the color
- If an object moves down along a ramp, as the angle of the ramp increases the speed of the object will .....
  - increase.
  - not change.
  - become zero.
  - decrease.
- As the mass of a vehicle increases, it needs ..... to move so it has .....
  - less force – less kinetic energy.
  - less force – less potential energy.
  - more force – more kinetic energy.
  - more force – more potential energy.

## (B) Give a reason for the following :

The speed of the ball increases when the bat hits it hardly.

.....  
.....

## 2 (A) Put (✓) or (x) :

(5 marks)

- Some of kinetic energy is changed during collisions of balls in Newton's cradle, as sound and thermal energies. ( )
- Both mass of a vehicle and its force cannot be measured directly. ( )
- After car collision, the air bags deflate as fast as they inflate. ( )
- We cannot create a new form of energy, and also we cannot destroy an existed form of energy. ( )

## (B) What happens if ... ?

Two bicycles move in an opposite direction, collide with each other.

.....



**3 (A) Correct the underlined words :***(5 marks)*

1. All moving objects always have a light energy. (.....)
2. Kinetic energy of an object doesn't depend on its speed, which affects its potential energy. (.....)
3. The number of moving balls of Newton's cradle must be more than that move at the other side. (.....)
4. As the mass of a car increases, the damage that occurs during collisions decreases. (.....)

**(B) Arrange the following sentences to show the steps of collision of Newton's cradle balls in the correct order :**

- (.....) Potential energy of the first ball decreases and changes into kinetic energy.
- (.....) Kinetic energy is transferred from the first ball to the rest of balls.
- (.....) Rise up the first ball, so it stores potential energy.
- (.....) Kinetic energy of all balls decreases gradually until they stop.

**4 (A) Write the scientific term of each of the following :***(5 marks)*

1. A heavy steel ball that swings on a cable, and is used in destruction of parts of buildings. (.....)
2. The process in which two objects or more crash into each other, and including an energy transfer. (.....)
3. They are present in car airbags, and allow them to deflate fast after collision. (.....)
4. The energy that can be heard and usually produced when two objects collide with each other. (.....)

**(B) If there is a crash between a small car and a truck :**

In your opinion which one of the two vehicles causes less damage, if you know that the mass of the small car = 2 tons and the mass of the truck = 5 tons, knowing that the two vehicles move at the same speed.

.....



# Model Exam

## on Theme (2)

Total mark

20
----

(5 marks)

### 1 (A) Choose the correct answer :

- When you move something toward you, this represents .....
  - pushing force.
  - light energy.
  - pulling force.
  - sound energy.
- The roller coaster has the most energy of motion, .....
  - when it goes up to the top of the hill.
  - when it goes down along to hill.
  - when it stops at the top of the hill.
  - when it stops at the bottom of the hill.
- Which of the following statements is correct ? .....
  - Cheetahs run slower than humans.
  - Dogs run faster than cheetahs.
  - Cheetahs run slower than dogs.
  - Cheetahs run faster than humans.
- The object that has the most kinetic energy, is ..... object.
  - the fastest and lightest
  - the slowest and lightest
  - the fastest and heaviest
  - the slowest and heaviest

### (B) Give reasons for :

- The shockwave truck is faster than the normal truck.  
.....  
.....

- A roller coaster doesn't need electricity during its movement down the hill.  
.....  
.....

### 2 (A) Put (✓) or (X) :

(5 marks)

- If two objects travel for equal amount of time, the object that travels a longer distance has a slower speed. ( )
- When a cricket bat hits the ball, its potential energy transfers to the ball. ( )
- The main difference between pulling and pushing forces is the direction of the force. ( )
- Clocks, cell phones and matches all work by batteries. ( )



**(B) What happens if ... ?**

1. A runner and a horse run for 5 minutes. (according to the covered distance).

.....  
 .....

3. The airbags in a car don't inflate during a crash.

.....  
 .....

**3 (A) Write the scientific term of each of the following :**

*(5 marks)*

1. A force that you make to change the direction of an object away from you. (.....)

2. The form of energy that increases when the speed of an object increases. (.....)

3. A structure in cheetah's body that sticks into the ground while running. (.....)

4. Safety equipment used to prevent car passengers from moving forward, when the car stops suddenly. (.....)

**(B) Cross out the odd word :**

1. The Sun – Electric heater – Match – Radio. (.....)

2. Potential energy – Chemical energy – Thermal energy – Light energy. (.....)

**4 (A) Complete the following sentences :**

*(5 marks)*

1. When you kick the ball that standing on land, it starts to .....

2. If the speed of an object decreases this means that its kinetic energy .....

3. When moving objects collide with each other, ..... is transferred between them.

4. Fans produce ..... energy, while a match produces ..... energy.

**(B) A train travels from Cairo to Alexandria in a distance of 200 kilometers in 2 hours, find its speed.**

.....  
 .....



Part

3

# Final Examinations

Model Exams On The First Term





# Model Exam (1)

## 1 (A) Choose the correct answer :

- The roots of kapok tree are not planted deeply in the soil, because .....  
a. the soil contains less water.      b. the soil contains more water.  
c. the climate is very cold.          d. the climate is very hot.
- The system responsible for moving your hand away from danger, such as touching a hot cup of tea, is the ..... system.  
a. digestive      b. respiratory      c. nervous      d. stomach
- Songs of humpback whales in winter are characterized by each of the following except .....  
a. having high-pitched sounds.      b. moving better through cold water.  
c. having soft sounds.                  d. having low-pitched sounds.
- When you move something toward you, this represents .....  
a. pushing force.   b. light energy.   c. pulling force.   d. sound energy.
- Electrical energy operates all the following devices, except .....  
a. radio.              b. candle.              c. cell phone.          d. television.

## (B) Give a reason for the following :

Seatbelts in cars are very important.

.....

## 2 (A) Put (✓) or (X) :

- Digestion process begins in stomach with the help of saliva. ( )
- Some animals have extra abilities that humans do not have, and these extra abilities are called super sensory adaptations. ( )
- Cats have excellent night vision, while snakes and bats are not. ( )
- When the air is released backward from the fire extinguishers fixed to a cart, the cart moves backward. ( )
- The bus that covers 60 kilometers in 1 hour has a speed = 60 m/sec. ( )

## (B) What happens if :

The speed of a car increases. (according to its kinetic energy)

.....

## 3 (A) Complete the following sentences :

- As the pollution rate of water in ponds and air increases, the number of amphibians .....
- The ..... is the organ that sends information to the brain when you smell the scent of a nice perfume.



3. When the lens in your eye can't focus the light properly this causes ..... vision.
4. To increase the speed of a moving car, we need to ..... the force that acts on it.
5. When a moving car hits a tree, a part of ..... energy of the car changes into a ..... energy which you hear it.

**(B) Classify the following actions in the table below according to the needed force :**

- |   |                        |
|---|------------------------|
| 1. Typing on a keyboard.                          | 2. Lifting a bag.      |
| 3. Moving a chair away from you                   | 4. Kicking a football. |
| 5. Closing your room's door from inside the room. |                        |
| 6. Oponing the door of a refregirator.            |                        |

Pulling force	Pushing force
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

**4 (A) Write the scientific term of each of the following :**

1. The part of the kapok tree which is supported by the buttress roots. (.....)
2. It delivers messages between the spinal cord and different body organs. (.....)
3. The short beeps in Morse code. (.....)
4. It is the force that is exerted when objects rub against each other. (.....)
5. One of the measuring units of time. (.....)

**(B) Find the speed of a runner, if you know that he covers 300 meters in 6 seconds.**

.....

.....



## Model Exam (2)

### 1 (A) Complete the following sentences :

1. Engineers use parachutes to slow down the motion of ..... and ..... to stop them.
2. The ..... energy depends on the speed of a moving object.
3. In the electric bell, ..... energy changes into ..... energy.
4. If you saw a cat, you have received this information through the sensory receptors in your ....., and then the nerves send a signal to your .....
5. Most animals can hunt when ..... bounces off a prey into their eyes, while bats can hunt when ..... bounces off a prey into their .....

### (B) Give a reason for the following :

When your friend catches a ball that is thrown in the air, the movement of the ball is stopped.

.....  
.....

### 2 (A) Choose the correct answer :

1. Displaying light is a type of communication that is found in .....
  - a. plants only.
  - b. plants and humans.
  - c. animals and humans.
  - d. animals only.
2. The reason that makes the eyes of fishing cats glow at night, is .....
  - a. the light that bounces off the surroundings.
  - b. the light that bounces off the membrane on the back of their eyes.
  - c. the main controlling center of their bodies.
  - d. the behavioral adaptation with the surroundings.
3. The speed of a ball moves down a ramp increases by increasing its ....., but its speed decreases by increasing the .....
  - a. friction force – mass.
  - b. mass – friction force.
  - c. temperature – mass.
  - d. mass – temperature.
4. Human can help restoring ecosystem by all of the following activities, except .....
  - a. replanting the cleared forests.
  - b. removing air and water pollutants.
  - c. producing more factories exhaust.
  - d. preserving existed plants and animals.
5. When a car moves up a ramp, this happens due to the effect of .....
  - a. gravity force.
  - b. balanced force.
  - c. sound energy.
  - d. kinetic energy.



**(B) What happens if ... ?**

Light falls on a mirror that has few cracks.

.....  
 .....

**3 (A) Correct the underlined words :**

1. A fan turns the chemical energy stored in natural gas into thermal energy. (.....)
2. Both factories exhausts and floods are producing smog, that causes air pollution. (.....)
3. The energy that is produced due to the friction between the string and other parts of the Newton's cradle, is the sound energy. (.....)
4. Hearing is one of the weak senses of the jerboa. (.....)
5. The friction between the car's windows and the road decreases the speed of the car. (.....)

**(B) Classify the following materials into opaque objects and transparent objects :**

"Wood – Air – Water – Metal – Lenses"

Opaque objects	Transparent objects
.....	.....
.....	.....
.....	.....
.....	.....

**4 (A) Write the scientific term of each of the following :**

1. A group of ants which is responsible for sending smelly messages when there is a shortage of food. (.....)
2. It is the force that pulls objects toward the center of the Earth. (.....)
3. Structural adaptation that prevents the loss of water in the pine tree. (.....)
4. A structure in cheetah's body that sticks into the ground while running. (.....)
5. The organ used to differentiate between different scents. (.....)

**(B) A truck travels a distance of 160 kilometers in 2 hours. Find its speed.**

.....  
 .....



## Model Exam (3)

### 1 (A) Choose the correct answer :

- Which of the following sentences describes the friction force ? .....
  - It pulls objects toward the ground.
  - It pushes objects away from the ground.
  - It slows down or stops objects in motion.
  - It doesn't affect objects in motion.
- In penguin's body, the insulating layer of fat and thick downy feathers trap ..... against the skin.
  - cold air
  - cold water
  - warm water
  - warm air
- The energy that is stored in an object due to its position, is known as .....
  - kinetic energy.
  - potential energy.
  - electrical energy.
  - chemical energy.
- When you see a car coming towards you, ..... to get away from it.
  - sensory receptors in the ears send a signal to the brain first
  - sensory receptors in the eyes send a signal to the brain first
  - sensory receptors in the eyes send a signal to sensory receptors in the ears
  - sensory receptors in the ears send a signal to sensory receptors in the eyes
- Pressing the gas pedal of a car sends more ..... into the engine.
  - air
  - water
  - milk
  - fuel

### (B) Give a reason for the following :

Mirror can reflect the light better than a painted surface.

.....

### 2 (A) Put (✓) or (X) :

- Your kinetic energy when moving on the Earth's surface is equal to your kinetic energy when moving down a ramp. ( )
- Humpback whales produce more than one type of songs. ( )
- The main difference between pulling and pushing forces is the direction of the force. ( )
- Sharp spines are adaptation of different plants to prevent animals from eating them. ( )
- As the height of an object from the Earth's surface increases, its potential energy increases. ( )

### (B) What happens if ... ?

Cheetah has a small heart.

.....



**3 (A) Write the scientific term of each of the following :**

1. They include the eyes, nose, ears, tongue and skin, and they receive information from the surroundings and send it to the brain. (.....)
2. They are present in car airbags, and allow them to deflate fast after collision. (.....)
3. A type of surface, that reflects light in different directions at which the light struck it. (.....)
4. A man-made object that is launched into orbit in the space using a rocket. (.....)
5. A large muscle that contracts during breathing in and relaxes during breathing out. (.....)

**(B) Classify the following living organisms according to their habitats into organisms live in deserts and organisms live in forests in the table below :**

(Starred agama lizard – Panther chameleon – Fennec fox – Kapok tree – Palm tree – Barbary fig plant).

Organisms live in deserts	Organisms live in forests
.....	.....
.....	.....
.....	.....

**4 (A) Complete the following sentences :**

1. You can arrive your house using a bicycle in a time ..... than the time taken when you use a car.
2. During inhalation, air travels down from your throat to your lungs through .....
3. If the driver takes his foot off the gas pedal, the speed of the car will ..... gradually until it stops due to the ..... between the car tires and the road.
4. Writing is a code that uses the sense of ..... to communicate.
5. Food inside the body of living organisms is similar to ..... inside the car, where burning each of them changes ..... energy into ..... energy.

**(B) Compare between :**

Points of comparison	Inhalation	Exhalation
1. Diaphragm movement :	.....	.....
2. Size of chest cavity :	.....	.....
3. The air is rich in :	..... gas.	..... gas.



## Model Exam (4)

### 1 (A) Write the scientific term of each of the following :

1. A property that helps animals to blend in with their surrounding environment. (.....)
2. A system that works inside the human body such that it keeps the human away from danger. (.....)
3. A human activity that done to obtain woods for making furniture. (.....)
4. The energy that is used to operate television. (.....)
5. The force that makes an object moves a distance. (.....)

### (B) Give one example for the following :

One of the sources of light which gives out its own light.

.....

### 2 (A) Choose the correct answer :

1. The potential energy of an object, depends on .....
  - a. its mass only.
  - b. its height from the Earth's surface only.
  - c. its mass and its height from the Earth's surface.
  - d. its temperature.
2. .... is considered as a behavioral adaptation in the panther chameleon.
  - a. Puffing up its body during danger
  - b. Each eye can move independently
  - c. V-shaped feet
  - d. Long sticky tongue
3. From the structural adaptation of water lily plant is that .....
  - a. it has long roots.
  - b. it has sharp spines.
  - c. it has tiny leaves.
  - d. it has wide leaves.
4. Meat is much easier to be processed than grass, so dogs have .....
  - a. more than one stomach and a short digestive system.
  - b. only one stomach and a short digestive system.
  - c. more than one stomach and a long digestive system.
  - d. only one stomach and a long digestive system.
5. All of the following are examples of motion except .....
  - a. a running person.
  - b. a ball travelling through the air.
  - c. a flying bird.
  - d. a sleeping dog.

### (B) What happens if ... ?

Human doesn't introduce new plants, animals and diseases to an ecosystem.

.....



**3 (A) Correct the underlined words :**

1. The balanced forces cause the object to move. (.....)
2. When you turn on a radio, the electrical energy changes into light energy. (.....)
3. Potential energy depends on the speed of an object. (.....)
4. The system that works with the eyes of living organisms for seeing objects, is the digestive system. (.....)
5. Rough objects reflect light at the same angle at which the light struck these objects. (.....)

**(B) If a cheetah runs behind a running deer. In your opinion, can the cheetah reach the deer and hunt it ?**

(Give a reason for your answer)

.....

.....

**4 (A) Complete the following sentences :**

1. The lens in your eye ..... the light in a point, while the tapetum lucidum membrane in cat's eyes ..... the light.
2. On hearing an alarm ring, the sensory receptors that are found in the ..... send a message through a network of nerves to the ..... which determines what to do to avoid danger.
3. The speed of a moving object on a smooth ramp is ..... than that of the same object that moves on a rough ramp.
4. Ants use their sense of ..... to communicate with each other, while bees use ..... by doing a special dances to communicate with each other.
5. If the kinetic energy of a moving body decreases, its speed will .....

**(B) Compare between :**

Points of comparison	Polar bear	Forest bear
1. Habitat :	..... .....	..... .....
2. Fur color :	..... .....	..... .....



# Model Exam (5)

## 1 (A) Choose the correct answer :

- When a car stops suddenly, the passengers move .....  
 a. backward.      b. forward.      c. upward.      d. downward.
- Reading and writing are common types of communication in ..... world.  
 a. humans      b. animals      c. birds      d. plants
- Bears that live in forests have fur ..... that of polar bears.  
 a. whiter than      b. darker than  
 c. similar to      d. brighter than
- When the roller coaster stops, its energy of motion .....  
 a. doesn't change.      b. increases.  
 c. decreases.      d. becomes zero.
- We can distinguish between water and milk through .....  
 a. taste and hearing.      b. sight and hearing.  
 c. smell and hearing.      d. taste and sight.

## (B) What happens if ... ?

The length of acacia taproot doesn't exceed 3 meters downward.

.....  
 .....

## 2 (A) Put (✓) or (X) :

- At night, cats eyes look like small lighted lamps. ( )
- The sandy-colored fur of caracal helps it blend in with snow in polar environment. ( )
- After car collision, the airbags deflate as fast as they inflate. ( )
- Radio is operated by sound energy, and produces electric energy. ( )
- The stopping object can't move until a force acts on it. ( )

## (B) Look at the following pictures, then choose if the forces are "balanced" or "unbalanced" :



1. Launching a rocket



2. A book on a table



3. A seesaw

(Balanced – Unbalanced) (Balanced – Unbalanced) (Balanced – Unbalanced)



**3 (A) Write the scientific term of each of the following :**

1. A type of foxes that has sandy-colored fur to adapt its desert environment. (.....)
2. It is the force that pulls objects toward the center of Earth. (.....)
3. The sense used to differentiate between smooth and rough surfaces. (.....)
4. Safety equipment used to provide soft cushion, when it is inflated automatically with a gas during collision of cars. (.....)
5. A plant lives in salt water habitat and has long, strong roots to resist the water waves. (.....)

**(B) Give a reason for the following :**

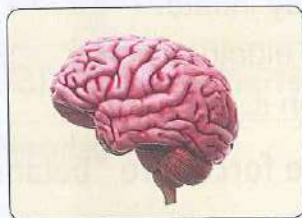
Branches of acacia tree are gather on the top of its trunk.

.....  
 .....

**4 (A) Correct the underlined words :**

1. Keeping the position of an object relative to a fixed point represents motion. (.....)
2. Moving an object towards you represents a pushing force. (.....)
3. Seatbelts absorb the energy of the car due to its collision and gets inflated (.....)
4. Under the effect of pushing force of gravity, anything falls down to the ground. (.....)
5. An airplane is slower than a train. (.....)

**(B) Look at the following figures, then complete the following sentences :**



Part (1)



Part (2)



Part (3)

1. These body parts belong to the ..... system.
2. When you touch a freezing bottle of water, part number ..... in your hand sends a message through part number ..... to reach part number ..... telling you that this bottle is very cold.



# Model Exam (6)

## 1 (A) Choose the correct answer :

- All the following properties are considered as structural adaptations in the panther chameleon except .....
  - each eye can move independently.
  - opening its mouth wide at danger.
  - V-shaped feet.
  - long sticky tongue.
- When an object is in motion, this means that its ..... changes.
  - color
  - shape
  - size
  - position
- Pine tree has a triangular shape to make snow slides over its branches without breaking it. This structural adaptation makes this tree face the extreme cold climate like the feet of .....
  - caracal.
  - penguin.
  - fennec fox.
  - brown bear.
- If there is nothing to stop the movement of an object, this object will .....
  - stay in motion.
  - stop after few hours.
  - stop after few minutes.
  - stop after few seconds.
- The following pieces of advice keep the digestive system healthy except .....
  - chewing food well.
  - avoid eating much fast meals.
  - drinking a little amount of water.
  - practicing sports regularly.

## (B) Give a reason for the following :

Some animals have the ability to make camouflage adaptation.

.....

## 2 (A) Put (✓) or (X) :

- Unbalanced forces keep an object in its place without moving. ( )
- If the nervous system works well, but the animal does not have enough energy to escape, it can be hunted by the predator. ( )
- The moving objects only have energy, while the objects that don't move have no energy. ( )
- In penguin's feet, the cold blood vessels can warm up the warm blood vessels. ( )
- The Moon is not considered as a light source. ( )

## (B) Classify which of the following animals have super sight sense and which of them have super hearing sense.

(Fishing cat – Dolphin – Tarsier – Bat)

Animals have super sight sense	Animals have super hearing sense
.....	.....
.....	.....



**3 (A) Write the scientific term of each of the following :**

1. An organ that has tiny blood vessels to absorb the nutrients through its walls. (.....)
2. A feature in the bull shark, in which the upper surface of its body is darker than its lower surface. (.....)
3. The environment in which fish live, and as it is clean the fish stay healthy. (.....)
4. The ability to do work or cause a change. (.....)
5. The organ used to differentiate between the taste of different types of food. (.....)

**(B) What happens if ... ?**

An object moves with a certain speed in the space.

.....

.....

**4 (A) Correct the underlined words :**

1. Two objects of the same mass and stopped at the same height, have the same kinetic energy. (.....)
2. A car battery stores a form of kinetic energy known as chemical energy. (.....)
3. As the object moves faster, its potential energy increases. (.....)
4. The cricket bat transfers its light energy to the ball. (.....)
5. The Moon is one of the light sources in the sky. (.....)

**(B) Look at the following figures that represent the respiration process, then answer the questions :**

1. Which figure represents inhalation. (.....)
2. Which figure represents exhalation. (.....)
3. In figure (a) ..... muscle contracts and the size of chest .....
4. The air that comes out in figure (b) is rich in ..... gas.

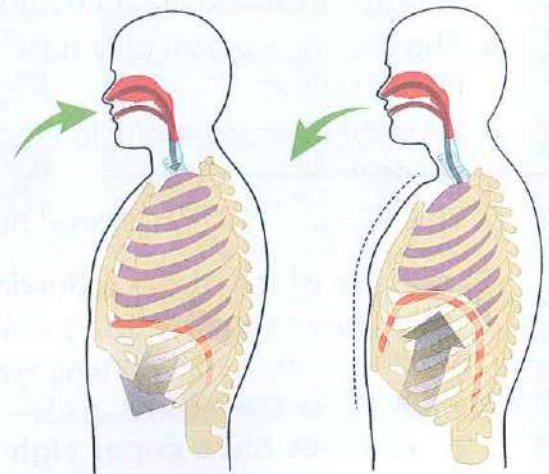


Fig. (a)

Fig. (b)



## Model Exam (7)

### 1 (A) Choose the correct answer :

- Camouflage means that the animal .....
  - can be seen easily among its surrounding.
  - is hard to be seen among its surrounding.
  - is easily to be seen by its preys.
  - can be seen easily by its predators.
- Cheetah's nose has large openings, which help it .....
  - breathe a lot of air.
  - breathe a little amount of air.
  - hide from its predator.
  - hide from its prey.
- The five senses of humans include .....
  - sight, hearing, touch, smell, and movement.
  - sight, movement, taste, touch, and smell.
  - taste, touch, movement, hearing, and smell.
  - sight, hearing, taste, smell, and touch.
- When an object moves down a ramp, its stored energy .....
  - increases.
  - doesn't change.
  - changes to a less active form of energy.
  - changes to a more active form of energy.
- The structural adaptation that helps the fishing cat to catch a prey at night, is that its ability .....
  - to feel the heat of prey's body.
  - to hide inside the forest.
  - to digest its prey easily.
  - of excellent night vision.

### (B) What happens if ... ?

A friction occurs between the string and the other parts of Newton's cradle during collision. (according to the change of energy)

.....

### 2 (A) Complete the following sentences :

- Among animals that can live in polar environment are ..... and .....
- Television operates by ..... energy and it produces ..... and ..... energies.
- When objects collide with each other, ..... is transferred between them.
- Echolocation is a type of communication that depends on the sense of ....., and it used by some animals such as ..... and .....
- Among the objects which give out their own light are ..... and ....., while ..... and ..... are objects that bounce off light.



(B) Choose from column (A) what suits it in both columns (B) and (C) :

(A) Living organisms	(B) Species	(C) Habitats
1. Bull shark :	a. reptile	A. savannah
2. Starred agama :	b. amphibian	B. salt and fresh water
3. Acacia :	c. fish	C. wet environment
4. Frog :	d. plant	D. desert environment

1. .... → ..... 2. .... → ..... 3. .... → ..... 4. .... → .....

3 (A) Put (✓) or (X) :

1. Exposing to air rich in dust harms the respiratory system. ( )
2. If two objects travel for equal amount of time, the object that travels a greater distance have a slower speed. ( )
3. When an object moves faster, it gains larger amount of kinetic energy. ( )
4. Camouflage helps animals adapt the extreme weather conditions in their ecosystems. ( )
5. Both human and fish need food and oxygen to get energy. ( )

(B) Find the speed of a horse, if you know that it covers 250 meters in 5 seconds.

.....

4 (A) Write the scientific term of each of the following :

1. A process through which the body gets oxygen from the air and expels out carbon dioxide. (.....)
2. An animal that has multiple bright colors to provide camouflage in its environment and has V-shaped feet. (.....)
3. An organ that is responsible for breathing and contains little sacs, in humans, frogs, cows but not in fish. (.....)
4. The liquid that stores chemical energy, and it is used to move cars. (.....)
5. The energy that is produced from electric fan. (.....)

(B) Give a reason for the following :

It is very dangerous to live in an ecosystem that has a high level of air pollution.

.....  
.....



## Model Exam (8)

### 1 (A) Put (✓) or (X) :

1. The motion of an object is affected by a friction force. ( )
2. Some animals prefer hunting during the night than hunting during the day. ( )
3. The object that travels down a ramp is affected by the force of gravity. ( )
4. Eyes are one of the five senses, on which humans and animals depend on to see the surroundings. ( )
5. All electric devices are operated by using light energy. ( )

### (B) Give a reason for the following :

The measuring unit of speed is km/hr or m/sec.

.....  
.....

### 2 (A) Choose the correct answer :

1. If the angle of inclination of the road increases, the kinetic energy of an object moving downward on it, will .....  
a. decrease.      b. increase.      c. remain as it is.      d. be destroyed.
2. In Morse code, long flashes can be used instead of .....  
a. dots only.      b. dashes only.  
c. both dots and dashes.      d. neither dots nor dashes.
3. Umbrella-shaped tree are .....  
a. mangrove tree and acacia tree.      b. mangrove tree and kapok tree.  
c. acacia tree and kapok tree.      d. barbary fig and water lilies.
4. Fennec foxes and arctic foxes live in burrows, this belongs to ..... adaptation.  
a. only structural      b. only behavioral  
c. both structural and behavioral      d. neither structural nor behavioral
5. To describe the color of your school bag to your friend, you should use the sense of .....  
a. sight.      b. smell.      c. taste.      d. touch.

(B) A train travels from Cairo to Alexandria for a distance of 220 kilometers in 2 hours. Find its speed.

.....  
.....



**3 (A) Correct the underlined words :**

1. Doctors help design cars and think about using energy. (.....)
2. As the mass of a car increases, the damage that occurs during collisions decreases. (.....)
3. Air enters the mouth of a fish and then passes across the gills. (.....)
4. The sense of eyesight of owls is weaker than that in bats. (.....)
5. Groups of ants within a colony have similar roles. (.....)

**(B) What happens if the amount of food in the ant's colony decreases ?**

.....

.....

**4 (A) Cross out the odd word :**

1. The Sun – The Moon – Fire – Candle. (.....)
2. Bats – Fireflies – Blind person's cane – Dolphins. (.....)
3. Fennec fox – Starred agama lizard – Panther chameleon – Bull shark. (.....)
4. Guitar – Flashlight – Radio – Alarm bell. (.....)
5. Smell – Taste – Eyes – Hearing. (.....)

**(B) Look at the opposite figure, then complete the following sentences :**

1. The person in this figure use .....  
to land safely.
2. The idea of person landing in this figure is the  
same idea of stopping the motion of .....  
and .....





## Model Exam (9)

### 1 (A) Complete the following sentences :

1. The bee dances in a figure-eight pattern while vibrating its ....., and the other bees read the ..... of the dancer and then fly off to the specific location.
2. When two cars move on the same road, car (A) moves at speed equals 10 m/sec., and car (B) moves at speed equals 20 m/sec., this means that car ..... moves longer distance than car ..... in the same time.
3. Humans, amphibians and reptiles have ..... to breath oxygen gas in air.
4. Among safety equipment which are used during collision of cars ..... and .....
5. When the lens in your eye can't focus the light properly this causes ..... vision.

### (B) Give a reason for the following :

If you push two similar toy cars, one of them may travel for a longer distance than the other.

.....

### 2 (A) Put (✓) or (X) :

1. As human needs clean water to drink, fish needs clean air to breathe. ( )
2. Seatbelt is one of the safety equipment in cars. ( )
3. Animals communicate with each other by using different senses. ( )
4. Sometimes it is easy to observe the force that stops an object. ( )
5. The desert lizard blend in with large green trees, to hide from its enemies. ( )

### (B) Find the speed of a runner, if you know that he covers 400 meters in 8 seconds.

.....  
.....

### 3 (A) Write the scientific term of each of the following :

1. A group of ants which is responsible for protecting the colony from dangers. (.....)
2. An animal that has a layer of fat and thick downy feathers to adapt extreme cold weather. (.....)
3. The visible form of energy, that enable us to see. (.....)
4. A system that works inside the human body such that it keeps the organism away from danger. (.....)
5. A structure in cheetah's body that is flexible and acts like a spring for its leg muscles. (.....)



**(B) What happens if bats cannot use echolocation property ?**

.....  
 .....

**4 (A) Choose the correct answer :**

- Energy can do all the following, except .....
  - It can be stored in an object.
  - It can be transferred from an object to another one.
  - It can be transformed from one form into another one.
  - It can be destroyed and cannot be created.
- The blind person's cane and ..... emit a high-pitched sound that bounces off objects forming an echo.
  - lizards
  - polar bears
  - bull sharks
  - bats
- By increasing the number of fire extinguishers fixed to a cart, .....
  - its speed increases.
  - its speed decreases.
  - its speed doesn't change.
  - its speed becomes zero.
- Speed is a measurement of how ..... something is moving.
  - long
  - tall
  - fast
  - heavy
- A very big truck needs ..... to move.
  - very small engine
  - small engine
  - very big engine
  - no engine

**(B) Write the senses that can be used in each of the following types of communication in the table below :**

Types of communication	The used senses
1. Watching TV.	.....
2. Flashing lights of fireflies.	.....
3. Echolocation in dolphins.	.....
4. Using the cell phone.	.....



# Model Exam (10)

## 1 (A) Choose the correct answer :

1. The wide pupils of human eyes, letting in ..... light than those of fishing cat.  
a. very large amount of                      b. large amount of  
c. more    d. less
2. Humans and cars are .....  
a. not able to produce sound energy.  
b. not able to produce kinetic energy.  
c. similar in obtaining energy to move.  
d. similar in adaptation to live and survive.
3. Push or pull actions are considered as types of .....  
a. force.                      b. device.                      c. energy.                      d. adaptation.
4. The nervous system can do all the following functions except .....  
a. gathering information.                      b. processing information.  
c. sending signals.                              d. falling of rains.
5. The speed of an object is measured in ..... or meters per second.  
a. kilograms per hour                              b. grams per second  
c. kilometers per hour                              d. kilograms per kilometers

## (B) Give a reason for the following :

The spinal cord plays an important role in the functioning of the nervous system.

.....  
.....

## 2 (A) Complete the following sentences :

1. When you push a table on the floor, the ..... transfers from your body to the table.
2. Echolocation property is used by ..... and ..... animals to locate their preys.
3. Most of ..... energy in the Newton's cradle is transferred from the first ball to the rest of balls.
4. To increase the ..... energy of any moving object we must increase its speed.
5. When a skater begins to skate, his stored ..... energy changes into ..... energy.

(B) A car moves forward a distance 100 kilometers in time equals 2 hours.  
Calculate the speed of the car.

.....  
.....



**3 (A) Choose from column (B) what suits it in column (A) :**

(A)	(B)
1. Esophagus	a. absorbs water from the undigested food to become solid waste.
2. Small intestine	b. mixes the food with an acid and digestive juices.
3. Large intestine	c. the digestion begins in it.
4. Stomach	d. food gets completely digested in it.
5. Mouth	e. is a tube has muscles that move the food down into the stomach.
	f. solid waste leaves the body through it.

1. .... 2. .... 3. .... 4. .... 5. ....

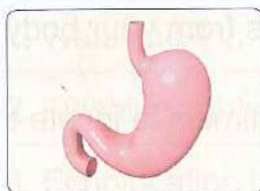
**(B) What happens if you let your toy car out of your hand ?**

.....

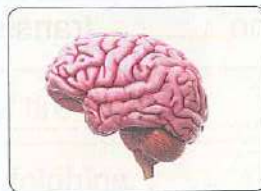
**4 (A) Put (✓) or (X) :**

- If two objects cover the same distance in the same time so, they have the same speed. ( )
- In a complete dark room, you can use the senses of touching, tasting, smelling and hearing only. ( )
- The moving objects only have energy, while the objects that don't move have no energy. ( )
- The brain responds to the auditory stimulus faster than the visual stimulus. ( )
- We cannot create a new form of energy, and also we cannot destroy an existed form of energy. ( )

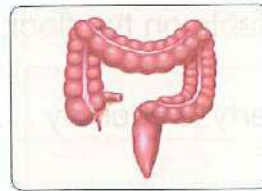
**(B) You have some pictures of different parts of the human body. Write down the organ number in front of the system to which it belongs in the following table :**



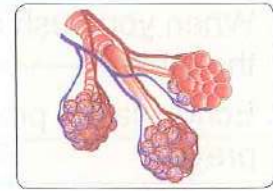
(1)



(2)



(3)



(4)

System name	Organ number
1. Digestive system :	.....
2. Respiratory system :	.....
3. Nervous system :	.....



 EL-MOASSER

# SCIENCE

By a group of supervisors

Guide Answers

THEME **2** MATTER  
& ENERGY



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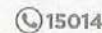
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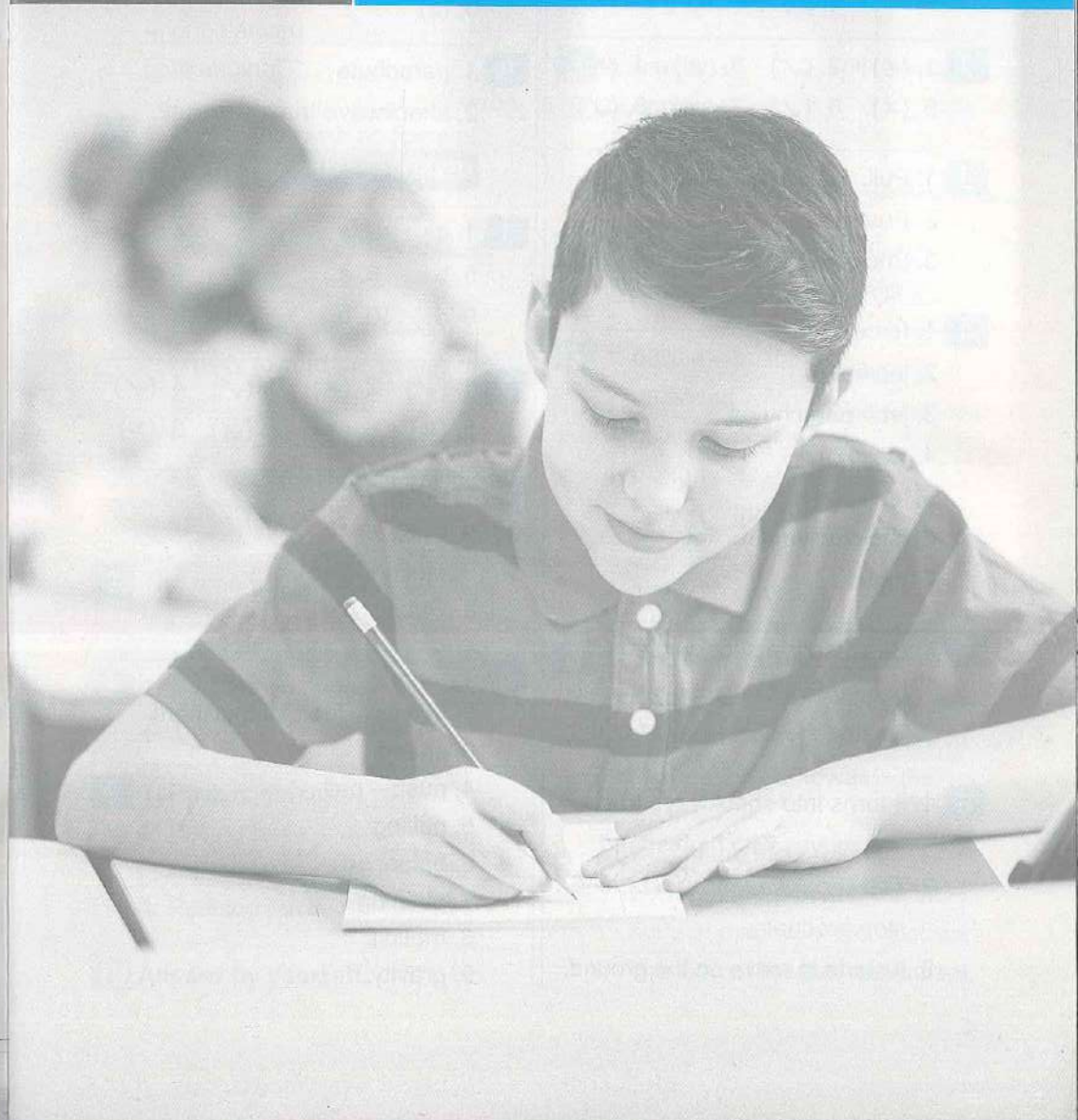
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Part

**1**

**Guide Answers of  
Exercises on Lessons**





## Concept (2.1)

## Exercises on Lesson 1

- 1 1. a 2. c 3. a 4. b  
5. d 6. b
- 2 1. (✗) 2. (✓) 3. (✓) 4. (✗)  
5. (✗) 6. (✓) 7. (✓) 8. (✓)
- 3 1. Pull.  
2. Push.  
3. Shockwave truck.
- 4 1. force  
2. increase  
3. jet – parachutes  
4. rocket.  
5. jet – stop  
6. shockwave – rocket  
7. move.
- 5 1. Because the shockwave truck has three jet engines.  
2. To stop the shockwave truck.
- 6 1. It turns into shockwave truck and moves with high speed.  
2. The shockwave truck starts to stop gradually.  
3. It starts to move on the ground.

- 7 1. Pulling force : 2 – 6  
2. Pushing force : 1 – 3 – 4 – 5

- 8 1. (2) – (1)  
2. (2) – (1)  
3. (2)

- 9 1. parachute  
2. shockwave truck – rocket.

## Exercises on Lesson 2

- 1 1. c 2. a 3. b 4. b  
5. b 6. c 7. d 8. d  
9. d 10. b
- 2 1. (✓) 2. (✗) 3. (✓) 4. (✓)  
5. (✗) 6. (✗) 7. (✓) 8. (✗)
- 3 1. Push.  
2. Pull.  
3. Motion.  
4. Gravity.
- 4 1. force  
2. leaves – fire extinguishers  
3. speed  
4. push – pull  
5. pulling  
6. balanced  
7. pushing  
8. motion.  
9. gravity.

## Exercises on Lesson 3

10. motion  
11. pushing – pulling  
12. fixed
- 5 1. decreasing  
2. pushing  
3. pulling  
4. unbalanced  
5. changing
- 6 1. Due to the pushing force of your leg that acts on it.  
2. Because the two forces are balanced, so the object doesn't move.  
3. Due to the pulling force of gravity toward the center of Earth.  
4. Due to the pushing force of his hand against the ball that make it stop.
- 7 The rope will not move because the two forces are balanced.
- 8 1. It will move faster.  
2. 1. (✓) 2. (✗)
- 9 1. Pushing force.  
2. Pulling force.  
3. Pulling force.  
4. Pushing force.
- 10 Answer by yourself.
- 1 1. c 2. b 3. b 4. b  
5. d 6. b 7. b 8. c
- 2 1. (✓) 2. (✗) 3. (✓) 4. (✗)  
5. (✓) 6. (✗) 7. (✗)
- 3 1. gravity 2. pull  
3. opposite  
4. decreases  
5. friction
- 4 1. Force. 2. Friction.  
3. Friction. 4. Satellite.
- 5 1. pulling – pushing  
2. balanced  
3. pulling – pulling  
4. friction  
5. pulling – friction  
6. gravity.  
7. friction – opposite
- 6 1. Because the wall applied a force to the car with the same amount of the force that pushes the car towards the wall.  
2. Due to the friction force between the pen and the table surface that act in the opposite direction of the pen movement.



3. Due to the friction force between the bicycle tires and the road that act in the opposite direction of the bicycle movement.
4. Because in space there is no air, so there is no friction force to slow down the satellite.

- 7** 1. It will fall down on the ground due to the pulling force of gravity.
2. It will move for a certain distance then it starts to stop gradually due to the friction force between the ball and the ground.
3. It will keep moving because there is no air as well as no friction force.

- 8** 1. d                      2. b

- 9** 1. Unbalanced.
2. Balanced.
3. Unbalanced.

#### Exercises on Lesson 4

- 1** 1. c    2. d    3. a    4. d  
5. c    6. d

- 2** 1. (✓)    2. (✗)    3. (✓)  
4. (✗)    5. (✗)

- 3** 1. long – short  
2. force – larger  
3. longer  
4. greater  
5. longer

- 4** 1. Due to the difference in the forces that act on each of them.
2. Because the small object travels faster than the bigger object when the same amount of force acting on them.

- 5** The ball that is affected by the greater force will move a farther distance than the other ball.

- 6** 1. Car (A), because it travels a farther distance than car (B)  
2. 1. c    2. b    3. d

#### Exercises on Lesson 5

- 1** 1. c    2. a    3. d    4. a

- 2** 1. (✓)    2. (✗)    3. (✗)    4. (✗)

- 3** 1. energy  
2. energy – work  
3. energy  
4. more

- 4** The second player, because he raises a weights heavier than the first player, so he need large amount of energy to do more work.

## Concept (2.2)

### Exercises on Lesson 1

- 1** 1. a    2. b    3. c    4. a  
5. d    6. b    7. d    8. c

- 2** 1. c    2. d    3. a

- 3** 1. (✓)    2. (✗)    3. (✗)    4. (✓)  
5. (✗)    6. (✗)

- 4** 1. Kinetic energy.  
2. Kinetic energy.  
3. Sound energy.  
4. Thermal energy.  
5. Chemical energy.  
6. Electrical energy.  
7. Kinetic energy.

- 5** 1. increases.  
2. light energy and sound energy.  
3. attraction force  
4. Kinetic.  
5. attraction force  
6. stop.

- 6** 1. electric motor – electricity.  
2. less                      3. decreases.  
4. electrical – kinetic  
5. mechanical – thermal  
6. electricity – computers – television.  
7. light – thermal – sound  
8. food – batteries – electrical  
9. electrical – sound – light.  
10. electrical heater – heat.

- 7** 1. Because its stored energy changes into kinetic energy, that helps it moves downward.
2. Because its kinetic energy increases.
3. Because each of them produces light and thermal energies.

- 8** 1. Its stored energy changes into kinetic energy.
2. It can't move, so it will stop.
3. Its stored energy changes into kinetic energy.

- 9** 1. Flashlight (all items produce sound energy, while flashlight produces light energy).
2. Radio (all items produce thermal energy, while radio produces sound energy).
3. Alarm bell (all items change electrical energy into mechanical energy, while alarm bell changes electrical energy into sound energy).

- 10** 1. b    2. d    3. c

- 11** 1. b    2. c    3. d    4. a

- 12** 1. Mechanical energy.  
2. Sound energy.  
3. Mechanical energy.  
4. Sound energy.  
5. Mechanical energy.  
6. Mechanical energy.



## Exercises on Lesson 2

- 1 1. b 2. b 3. c 4. d  
5. b 6. b 7. c 8. b

- 2 1. f 2. d 3. b 4. e  
5. c

- 3 1. (✗) 2. (✗) 3. (✓) 4. (✗)  
5. (✗) 6. (✓) 7. (✗) 8. (✓)  
9. (✓) 10. (✗) 11. (✓)

- 4 1. Electrical energy.  
2. Sound energy.  
3. Potential energy.  
4. Kinetic energy.  
5. Energy. 6. Work.  
7. Potential energy.

- 5 1. Thermal energy  
2. kinetic energy  
3. work 4. light  
5. kinetic energy  
6. potential energy

- 6 1. energy. 2. work.  
3. kinetic  
4. potential – increase.  
5. light – sound – thermal  
6. kinetic 7. potential  
8. increase. 9. decrease.

- 7 1. Because the kinetic energy of the ball transfers to the goal net.  
2. Because the apple is found at a height from the Earth's surface, so it has potential energy.

3. Because its height from the Earth's surface increases.

- 8 1. The object has potential energy.  
2. The potential energy of the apple changes into kinetic energy.  
3. The potential energy of the book will increase.

- 9 1. c 2. a

- 10 1. a 2. b

- 11 1. potential – kinetic  
2. potential

## Exercises on Lesson 3

- 1 1. d 2. c 3. d 4. b  
5. c 6. c 7. c 8. c  
9. d

- 2 1. b 2. f 3. d 4. a  
5. c

- 3 1. (✗) 2. (✓) 3. (✓) 4. (✗)  
5. (✗) 6. (✗) 7. (✓) 8. (✓)

- 4 1. Potential energy.  
2. Chemical energy.  
3. Light energy.  
4. Thermal kinetic energy.  
5. Gravitational potential energy.  
6. Elastic potential energy.

- 5 1. Kinetic energy.  
2. Thermal kinetic energy.  
3. decreases 4. sound.  
5. potential energy  
6. Gas oven

- 6 1. gravitational – chemical – sound  
2. gravitational – elastic  
3. thermal – kinetic  
4. light – sound  
5. sound – mechanical  
6. electrical – sound  
7. light – thermal  
8. chemical – thermal  
9. potential – kinetic  
10. sound – thermal  
11. thermal – kinetic  
12. electrical – sound – light

- 7 1. Because it produces light and thermal energies.  
2. Because the potential energy which is stored in the spring changes into kinetic energy.

- 8 1. The electrical energy changes into mechanical energy.  
2. The potential energy changes into kinetic energy.  
3. The electrical energy changes into light and thermal energies.

- 9 1. Chemical energy (all items are forms of kinetic energy, while chemical energy is a form of potential energy).

2. Light energy (all items are forms of energy, that can't be seen, while light energy is a form of energy that can be seen).  
3. Radio (all items are devices that change electrical energy into mechanical energy, while radio changes it into sound energy).

- 10 1. a 2. b 3. d

## Exercises on Lesson 4

- 1 1. d 2. d 3. c 4. c  
5. b 6. d

- 2 1. b 2. e 3. a 4. c

- 3 1. (✓) 2. (✓) 3. (✓) 4. (✓)  
5. (✗) 6. (✓)

- 4 1. fuel 2. food  
3. chemical 4. sound

- 5 1. Gasoline.  
2. Chemical potential energy.  
3. Car engine.

- 6 1. mechanical kinetic – sound – thermal  
2. kinetic – movement  
3. gasoline – food – battery  
4. fuel (gasoline) – chemical – kinetic  
5. chemical – kinetic



- 7** 1. Because the burning of it (fuel) changes its stored chemical energy into kinetic energy.  
2. Because burning of each of them produces kinetic energy that enables the car to move and the human to carry out different activities.

- 8** 1. The stored chemical energy in gasoline doesn't change into kinetic energy so the car can't move.  
2. The stored chemical energy of food changes into kinetic energy so human can carry out different activities.  
3. The stored chemical energy in the battery changes into light and thermal energies.

- 9** 1. Car's engine. 2. Food.  
3. Gas oven. 4. Flashlight.

- 10** 1. chemical  
2. Electrical  
3. Sound

#### Exercises on Lesson 5

- 1** 1. c 2. b 3. d 4. b

- 2** 1. d 2. c 3. a

- 3** 1. (✗) 2. (✓) 3. (✗) 4. (✓)  
5. (✗)

- 4** 1. potential energy.  
2. potential energy.  
3. kinetic energy.  
4. more potential energy.  
5. kinetic energy.

- 5** 1. Gravitational potential energy.  
2. Potential energy.  
3. Kinetic energy.

- 6** 1. potential – kinetic  
2. gravity  
3. least – most  
4. potential – kinetic

- 7** 1. Because when he is found at the top of the jump he has the most height from the Earth's surface.  
2. Because the gravity pulls him back down.

- 8** 1. His potential energy changes into kinetic energy.  
2. His kinetic energy changes into potential energy.

- 9** 1. c 2. a 3. c

- 10** 1. c 2. b

### Concept (2.3)

#### Exercises on Lesson 1

- 1** 1. d 2. b 3. c 4. a  
5. c 6. d 7. a 8. c  
9. d

- 2** 1. e 2. d 3. b 4. a

- 3** 1. (✓) 2. (✗) 3. (✗) 4. (✓)  
5. (✗) 6. (✓) 7. (✗)

- 4** 1. Kilometer or Meter.  
2. Hour or second.  
3. Cheetah. 4. Claws.  
5. Spine.

- 5** 1. distance – time  
2. meter – second – kilometer – hour.  
3. cheetah  
4. more  
5. low – air  
6. spine (backbone) – claws  
7. distance – time.

- 6** 1. To decrease the air resistance and this make cheetah moves faster.  
2. To help it breathe a lot of air.  
3. To push off the ground which makes it faster.

- 7** 1. The horse travels a distance more than the runner in the same time.  
2. It cannot run faster.  
3. The air resistance will increase during cheetah's running, and this make cheetah runs slower.  
4. It cannot allow cheetah runs faster.  
5. It cannot push off the ground, while running, so it will run slower.

- 8** Yes, because cheetah is the fastest land animal in the world which is faster than the deer.

- 9** Figure (5) → Figure (4) → Figure (2) → Figure (1) → Figure (3)

#### Exercises on Lesson 2

- 1** 1. c 2. a 3. c 4. a  
5. d 6. a 7. c 8. a

- 2** 1. (✗) 2. (✓) 3. (✓) 4. (✗)  
5. (✓) 6. (✗) 7. (✗)

- 3** 1. slower 2. speed.  
3. smaller 4. Speed  
5. faster



- 4** 1. faster  
2. equal to  
3. meter – hour – second  
4. distance – time  
5. distance – time  
6. distance – time.  
7. distance – time.  
8. more  
9. 20
- 5** 1. Because the speed is the distance traveled in a certain amount of time.  
2. Because the speed of the bus is more than the speed of the bicycle.
- 6** He arrive his house in a short time, because the speed of the bicycle is more than its speed of walking.
- 7** 1. Its speed =  $100 \div 1$   
= 100 km/hr.  
2. It speed =  $80 \div 1 = 80$  km/hr.  
3. car (A)
- 8** The fastest car is car (C), because it has the highest speed which is 200 km/hr.
- 9** The speed of the runner  
= Distance  $\div$  Time  
=  $400 \div 8 = 50$  m/sec.

- 10** The speed of the train  
= Distance  $\div$  Time  
=  $200 \div 2 = 100$  km/hr.

### Exercises on Lesson 3

- 1** 1. a 2. a 3. d 4. b
- 2** 1. (✓) 2. (✓) 3. (✓) 4. (✗)
- 3** 1. less 2. height  
3. increase 4. more
- 4** Because the speed of the car increases when it moves down a ramp road.
- 5** The speed of the toy car will increase.
- 6** Ball (B), Because it moves on a ramp but ball (A) moves on a flat surface, so it has speed higher than ball (A).

### Exercises on Lesson 4

- 1** 1. c 2. d 3. b 4. d  
5. a 6. c 7. c
- 2** 1. e 2. d 3. a 4. b
- 3** 1. (✓) 2. (✗) 3. (✓)  
4. (✗) 5. (✓)

- 4** 1. 40 2. 25 km/hr.  
3. distance  $\div$  time  
4. slower 5. decreases

- 5** 1. 10 – second. 2. (B) – (A)  
3. 6 m/sec. 4. increase  
5. kinetic 6. increase.  
7. kinetic

- 6** 1. Because it has high speed.  
2. Because if the angle of inclination increases, the speed of the object will increase.

- 7** 1. The kinetic energy of the car will increase.  
2. The kinetic energy of the bicycle will decrease.

- 8** The speed of the car  
=  $\frac{\text{Distance}}{\text{Time}} = \frac{100}{2} = 50$  km/hr.

- 9** 1. • Speed of the car (A)  
=  $\frac{\text{Distance}}{\text{Time}} = \frac{80}{1} = 80$  km/hr.  
• Speed of car (B)  
=  $\frac{\text{Distance}}{\text{Time}} = \frac{200}{4} = 50$  km/hr.  
2. Car (A) is faster than car (B), because it moves at a speed higher than car (B)

- 10** Toy truck (A), because the height of the ramp of toy truck (A) is more than the height of the ramp of toy truck (B).

- 11** 1. (C) – (A) 2. 60  
3. (A) – (B) – (C)  
4. Car (C)  $\rightarrow$  Car (D)  $\rightarrow$   
Car (B)  $\rightarrow$  Car (A)

### Exercises on Lesson 5

- 1** 1. b 2. a 3. d 4. a  
5. d 6. a 7. a 8. d
- 2** 1. (✓) 2. (✗) 3. (✗) 4. (✓)  
5. (✓) 6. (✗) 7. (✗) 8. (✓)
- 3** 1. decrease. 2. increases.  
3. potential 4. tires  
5. 15
- 4** 1. kinetic 2. increase  
3. chemical – kinetic  
4. force 5. (B) – (A)  
6. decrease – friction
- 5** 1. Because when the kinetic energy decreases, the speed of the moving object will decrease.  
2. To send more gasoline into the engine, and this allows the engine to convert more chemical potential energy into kinetic energy, so its speed will increase.
- 6** 1. Its speed will increase and it will move faster.  
2. Its speed will decrease gradually until it stop.



7 1. • Speed of car (A)  

$$= \frac{\text{Distance}}{\text{Time}} = \frac{12}{6} = 2 \text{ m/sec.}$$

• Speed of car (B)  

$$= \frac{\text{Distance}}{\text{Time}} = \frac{9}{3} = 3 \text{ m/sec.}$$

• Speed of car (C)  

$$= \frac{\text{Distance}}{\text{Time}} = \frac{20}{5} = 4 \text{ m/sec.}$$

2. Toy car (C), because it moves with the highest speed than the other toy cars.

#### Exercises on Lesson 6

- 1 1. d 2. a 3. c  
4. b 5. d
- 2 1. (✓) 2. (✗) 3. (✗) 4. (✓)  
5. (✗) 6. (✓)
- 3 1. Mechanical engineers.  
2. smaller  
3. Decreasing 4. time.
- 4 1. speed.  
2. gasoline – climate  
3. less  
4. distance – time – speedometer.  
5. solar – electric
- 5 1. To make solar vehicle drive as quickly as the normal vehicle.  
2. Because solar vehicle doesn't have speedometer.

- 6 It will move with less speed, because it depends on the sunlight energy which is less than the amount of energy gets from gasoline or an electric battery.

7 - The time taken =  $7 - 5$   
 $= 2 \text{ hours.}$   
 - The speed of solar vehicle  
 $= \frac{\text{Distance}}{\text{Time}} = \frac{100}{2} = 50 \text{ km/hr.}$

#### Concept (2.4)

#### Exercises on Lesson 1

- 1 1. c 2. c 3. d 4. b  
5. a 6. c 7. b 8. d
- 2 1. e 2. c 3. d 4. a
- 3 1. (✗) 2. (✗) 3. (✓) 4. (✗)  
5. (✓) 6. (✓)
- 4 1. Wrecking ball.  
2. Seatbelt.  
3. Airbag.  
4. Vents.
- 5 1. kinetic energy  
2. Wrecking ball.  
3. car  
4. changes.

5. Airbags  
6. thin nylon  
7. kinetic energy.

- 6 1. heavier – faster  
2. kinetic – increases.  
3. seatbelts – airbags.  
4. change.  
5. airbag  
6. energy  
7. energy  
8. seatbelt

- 7 1. Because the kinetic energy of the bat transfers to the ball.  
2. Because the seatbelts are used in cars to keep the driver's body and also the passengers from moving forward when the car stops suddenly.  
3. Because the airbags slow the speed of the driver moving forward and they absorb the energy of the car due to its collision.
- 8 1. The kinetic energy of the bat transfers to the ball.  
2. The energy of collision will push the driver forward strongly that causes many harms to him.

- 9 1. b 2. d 3. c 4. d

- 10 1. The car is damaged more than the train. Because the car is slower and lighter than the train and the car has less energy.  
2. Airbags inflate automatically.

#### Exercises on Lesson 2

- 1 1. b 2. d 3. c 4. c  
5. a 6. c 7. b
- 2 1. c 2. e 3. a 4. d
- 3 1. (✗) 2. (✗) 3. (✓) 4. (✗)  
5. (✗) 6. (✗)
- 4 1. Collision.  
2. Sound energy.  
3. Fuel.
- 5 1. kinetic energy  
2. kinetic energy  
3. potential energy.
- 6 1. collision.  
2. kinetic – sound  
3. kinetic  
4. more  
5. more  
6. light – sound



- 7** 1. Because a part of kinetic energy changes into sound energy.  
2. Because if the car increases its speed, its kinetic energy increases that results in exerting a large force during an accident.

- 8** 1. The kinetic energy of the car increases.  
2. The damage would be much more severe.

- 9** 1. The rabbit has the most kinetic energy. Because the speed of rabbit is more than that of tortoise.  
2. decrease.

- 10** 1. c    2. b    3. a

**Exercises on Lesson 3**

- 1** 1. c    2. a    3. a    4. c  
5. a    6. b    7. c    8. c

- 2** 1. a    2. d    3. b

- 3** 1. (✗)    2. (✗)    3. (✓)  
4. (✗)    5. (✓)

- 4** 1. double  
2. kinetic energy  
3. more  
4. kinetic energy

- 5** 1. speed – kinetic  
2. more            3. decrease  
4. more  
5. more – mass – kinetic  
6. kinetic            7. less  
8. chemical – kinetic

- 6** 1. Because the truck has mass more than the car.  
2. Because the car has a smaller engine than the bus.  
3. Because the truck has a bigger mass, than the small car.

- 7** 1. Its kinetic energy will decrease.  
2. Its kinetic energy will increase.  
3. The damage would be much more severe.  
4. The kinetic energy of the truck is more than that of the small car.

- 8** ..... car ..... truck .....  
more .....

- 9** 1. d    2. b    3. c    4. d

**Exercises on Lesson 4**

- 1** 1. b    2. d    3. c    4. d  
5. d    6. c

- 2** 1. b    2. d    3. a

- 3** 1. (✓)    2. (✓)    3. (✗)  
4. (✗)    5. (✗)

- 4** 1. decreases.    2. height  
3. a large

- 5** 1. increase – decrease.  
2. kinetic – angle  
3. speed – kinetic  
4. decrease.  
5. less            6. less

- 6** 1. Because the car with mass 3 tons has speed and kinetic energy more than that of the car with mass 1 ton.  
2. Because the truck has mass more than that of the car, so the truck has speed and kinetic energy more than that of the car.  
3. Because the speed and kinetic energy of a toy car increase by increasing the angle of the ramp.

- 7** 1. The time that taken to reach the end of ramp will decrease.  
2. The speed of the car will increase.

- 8** 1. Ramp (A). Because the speed of the truck increases by increasing the angle of the ramp.  
2. The truck is faster than the car. Because the mass of the truck is more than that of the car, so the speed of the truck is more than that of the car.  
3. The speed of truck will increase.

- 9** 1. (✗)    2. (✓)    3. (✗)    4. (✓)  
5. (✗)

**Exercises on Lesson 5**

- 1** 1. c    2. d    3. b    4. b  
5. b    6. b    7. d

- 2** 1. b    2. d    3. c

- 3** 1. (✗)    2. (✓)    3. (✓)    4. (✗).

- 4** 1. decreases    2. changes  
3. equal  
4. thermal energy

- 5** 1. potential  
2. potential – kinetic  
3. kinetic  
4. kinetic – sound  
5. kinetic – thermal – friction  
6. friction – kinetic  
7. potential – kinetic  
8. kinetic – stop

- 6** 1. Because some of the kinetic energy changes into sound energy during collision.  
2. Because the energy is conserved during the collision, so it cannot be destroyed.

- 7** 1. It stores potential energy and doesn't have any kinetic energy.  
2. The potential energy changes into kinetic energy.



3. Some of kinetic energy changes into thermal energy.

- 8 (1) Rise up the first ball, .....  
 (2) Potential energy of the first ball decreases .....  
 (3) Kinetic energy is transferred from the first ball .....  
 (4) Kinetic energy of all balls decreases .....

9 1. c 2. b 3. a

**Exercises on Lesson 6**

1 1. c 2. d 3. b 4. b  
 5. c 6. d

2 1. (✓) 2. (✗) 3. (✓) 4. (✗)  
 5. (✓)

3 1. increases.  
 2. kinetic energy  
 3. Airbags

4 1. motion  
 2. photos – videos  
 3. motion – stops  
 4. increases.

5 1. To get more information about the crash without blocking the road.  
 2. To check their damages accurately.

6 (A) 1. Time – 100  
 2.  $\frac{\text{Distance}}{\text{Time}} = 120$   
 (B) 1. b 2. c

7 1. Photos and videos.  
 2. The truck causes more damage than the car.

# Part 2

## Guide Answers of Self-Assessments





## Concept (2.1)

## Self-Assessment 1

- 1 (A) 1. (✗) 2. (✓) 3. (✓)  
(B) To stop their movement.

- 2 (A) 1. b 2. d 3. a  
(B) The shockwave truck, because it has three jet engines that make it faster than the normal truck.

- 3 1. Shockwave truck.  
2. It will move with a slower speed.  
3. It can't stop quickly.

## Self-Assessment 2

- 1 (A) 1. a 2. b 3. a  
(B) This team will win the game, because the rope will move toward the team of greater pulling force.

- 2 (A) 1. parachutes.  
2. greater  
3. pushing  
(B) Because by increasing the number of fire extinguishers, the speed of the cart will increase.

- 3 1. a 2. b 3. a

## Self-Assessment 3

- 1 (A) 1. Pushing force of table – pulling force of gravity.  
2. balanced.  
3. friction  
(B) Due to the effect of pulling force of gravity toward the center of the Earth.

- 2 (A) 1. (✗) 2. (✓) 3. (✗)  
(B) Friction force of air and friction force between the car tires and the road.

- 3 (A) 1. (✗) 2. (✓) 3. (✓)  
(B) 1 – 2

## Self-Assessment 4

- 1 (A) 1. b 2. d 3. a  
(B) Due to the friction force between the ball and the ground that acts in the opposite direction of ball movement.

- 2 (A) 1. Pulling force.  
2. Force of gravity.  
3. Jet engine.  
(B) The car travels a distance longer than the truck.

- 3 1. pushing 2. ground – air.  
3. decreases 4. longer  
5. more

## Self-Assessment 5

- 1 (A) 1. a 2. a 3. b  
(B) Because there is a friction force between the moving body and the ground that acts in the opposite direction of the body movement.

- 2 (A) 1. equal to 2. equal to  
3. shorter  
(B) Because car (B) is smaller than car (A), so it travels a distance longer than car (A).

- 3 (A) 1. ③ and ④  
2. ① and ②  
3. Friction.  
(B) 1. (✗) 2. (✓) 3. (✓)

## Model Exam on Concept (2.1)

- 1 (A) 1. b 2. d  
3. b 4. d  
(B) The shockwave truck starts to stop gradually.

- 2 (A) 1. (✗) 2. (✓)  
3. (✓) 4. (✗)  
(B) Due to the help of powerful three jet engines.

- 3 (A) 1. energy 2. longer  
3. pulling – pulling  
4. fixed  
(B) Car (A), because it travels a farther distance than car (B).

- 4 (A) 1. Pull. 2. Push.  
3. Force. 4. Friction.  
(B) It will move faster.

## Concept (2.2)

## Self-Assessment 6

- 1 (A) 1. c 2. d 3. b  
(B) The stored energy in the train is changed into kinetic energy.

- 2 (A) 1. (✓) 2. (✗) 3. (✓)  
(B) Because his stored potential energy changes into kinetic energy.

- 3 1. ① – ②  
2. ② – ③  
3. kinetic – increase

## Self-Assessment 7

- 1 (A) 1. d 2. c 3. d  
(B) Because when it is thrown upwards, its height from the Earth's surface will increase, so its potential energy increases.



- 2 (A) 1. (✗) 2. (✓) 3. (✓)  
 (B) Its potential energy changes into kinetic energy.

- 3 1. a 2. d 3. d 4. c

### Self-Assessment 8

- 1 (A) 1. c 2. a 3. b  
 (B) Because there are three forms of it which are gravitational, chemical and elastic potential energies.

- 2 (A) 1. (✗) 2. (✗) 3. (✗)  
 (B) Its potential energy changes into kinetic energy.

- 3 1. a 2. c 3. a

### Self-Assessment 9

- 1 (A) 1. b 2. c 3. c  
 (B) Because when the gasoline is burned, its chemical potential energy changes into kinetic energy that causes the car movement.

- 2 (A) 1. (✓) 2. (✗) 3. (✗)  
 (B) Its chemical potential energy changes into kinetic energy that causes the car movement.

- 3 1. c 2. a 3. b

### Self-Assessment 10

- 1 (A) 1. b 2. d 3. b  
 (B) Because the gravity pulls him back down to the ice.

- 2 (A) 1. (✓) 2. (✓) 3. (✗)  
 (B) Its potential energy changes into kinetic energy.

- 3 1. a 2. b 3. d

### Model Exam on Concept (2.2)

- 1 (A) 1. d 2. c 3. d 4. b  
 (B) Because each of them produces light and thermal energies.

- 2 (A) 1. (✗) 2. (✓) 3. (✗) 4. (✓)  
 (B) 1. chemical  
 2. Electrical 3. Sound

- 3 (A) 1. Kinetic energy  
 2. Thermal energy  
 3. Potential energy  
 4. chemical  
 (B) Its potential energy changes into kinetic energy.

- 4 (A) 1. Kinetic energy.  
 2. Electrical energy.  
 3. Elastic potential energy.  
 4. Chemical potential energy.

- (B) 1. Chemical energy. (all items are forms of kinetic energy, while chemical energy is a form of potential energy).  
 2. Rodio. (all items are devices that change electrical energy into mechanical energy, while radio changes it into sound energy).

### Concept (2.3)

#### Self-Assessment 11

- 1 (A) 1. (✗) 2. (✗) 3. (✓)  
 (B) It cannot breathe a lot of air.
- 2 (A) 1. Kilometer/hour (meter/second)  
 2. Nose.  
 3. spine.  
 (B) 1. It has flexible spine (backbone) that acts like a spring for its leg muscles.  
 2. It has a large, oversized powerful heart.

- 3 1. shorter 2. greater  
 3. greater 4. speed.

#### Self-Assessment 12

- 1 (A) 1. b 2. c 3. d  
 (B) It will move with a higher speed (its speed will increase).

- 2 (A) 1. time 2. cheetah.  
 3. smaller  
 (B) Because the speed is the distance traveled in a certain amount of time.

- 3 1.  $3 + 3 = 1$   
 2.  $24 \div 8 = 3$   
 3.  $10 + 5 = 2$   
 4.  $(1) - (3) - (2)$

#### Self-Assessment 13

- 1 (A) 1. distance – time  
 2. distance – time  
 3. longer  
 (B) Because the speed of any moving object down a ramp, is depended on the change of the height of the ramp.

- 2 (A) 1. (✓) 2. (✗) 3. (✓)  
 (B) Its speed will increase.

- 3 1. The boy. Because he has a greater mass.  
 2. The boy. Because the smooth surface has less friction force that allows moving through it faster than the rough surface.

#### Self-Assessment 14

- 1 (A) 1. c 2. a 3. d  
 (B) Because the horse travels a distance more than the runner in the same amount of time.



- 2 (A) 1. 80 km/hr.  
2. decrease  
3. increase.

(B) The speed of the train  
= Distance ÷ Time  
=  $200 \div 4 = 50$  km/hr.

- 3 1. (B)            2. (B) – (A)  
3. (B) – (A)

### Self-Assessment 15

- 1 (A) 1. d        2. c        3. a  
(B) Due to the friction force between the car's tires and the road.

- 2 (A) 1. (✗)    2. (✗)    3. (✓)  
(B) It starts to move with a certain speed.

- 3 1. a            2. a            3. c

### Self-Assessment 16

- 1 (A) 1. speedometer  
2. kinetic  
3. speed – kinetic  
(B) Its speed will decrease.

- 2 (A) 1. Kinetic energy.  
2. Solar vehicle.  
3. Potential energy.  
(B) - The time taken to cover that distance =  $6 - 2 = 4$  hours  
- The speed of the solar vehicle  
$$= \frac{\text{Distance}}{\text{Time}} = \frac{240}{4} = 60 \text{ km/hr.}$$

- 3 1. (B) – (A)    2. (A) – (B)  
3. (A)

### Model Exam on Concept (2.3)

- 1 (A) 1. solar – electric  
2. distance – time.  
3. kinetic    4. more

(B) The kinetic energy of the bicycle will decrease.

- 2 (A) 1. 25 km/hr.    2. Speed  
3. tires            4. Decreasing

(B) Ball (B). Because it moves on a ramp but ball (A) moves on a flat surface, so it has speed higher than ball (A).

- 3 (A) 1. d            2. a  
3. a                4. c

(B) To decrease the air resistance and this make cheetah moves faster.

- 4 (A) 1. (✓)        2. (✓)  
3. (✗)            4. (✓)

(B) - The time taken =  $7 - 5$   
= 2 hours  
- The speed of solar vehicle  
$$= \frac{\text{Distance}}{\text{Time}} = \frac{100}{2} = 50 \text{ km/hr.}$$

## Concept (2.4)

### Self-Assessment 17

- 1 (A) 1. d        2. c        3. d  
(B) To make the driver can get out of the car.

- 2 (A) 1. (✓)    2. (✓)    3. (✗)  
(B) The airbags will inflate and fill with a gas.

- 3 ..... kinetic ..... different .....  
bicycle ..... car.

### Self-Assessment 18

- 1 (A) 1. b        2. a        3. c  
(B) Because the speed of the rabbit is more than that of tortoise.

- 2 (A) 1. (✗)    2. (✗)    3. (✓)  
(B) Its kinetic energy will increase.

- 3 1. c            2. b            3. c            4. b

### Self-Assessment 19

- 1 (A) 1. c        2. c        3. d  
(B) Because the vehicle with the large mass has kinetic energy more than that of the vehicle with the small mass, so it causes more damage.

- 2 (A) 1. (✗)    2. (✓)    3. (✓)  
(B) Its kinetic energy will increase.

- 3 1. b            2. a            3. c

### Self-Assessment 20

- 1 (A) 1. d        2. a        3. c  
(B) Because the speed of the object that moves down a ramp increases by increasing the angle of the ramp.

- 2 (A) 1. (✗)    2. (✓)    3. (✓)  
(B) Its kinetic energy will increase.

- 3 1. b            2. d            3. a            4. b

### Self-Assessment 21

- 1 (A) 1. c        2. d        3. c  
(B) Because some of kinetic energy of balls changes into sound energy.

- 2 (A) 1. (✗)    2. (✓)    3. (✓)  
(B) Their kinetic energy will decrease gradually until they stop.

- 3 1. b            2. d

### Self-Assessment 22

- 1 (A) 1. d        2. b        3. c  
(B) Because the traffic cameras provide the crash investigators with photos and videos to get more information about the accident without blocking the road.

- 2 (A) 1. (✗)    2. (✓)    3. (✗)  
(B) 1. Take measurements from the scene of the accident.  
2. Collecting data.



- 3 The truck is the main reason that causes this accident.  
Because the speed of the truck is more than the speed of the road that shown by the traffic sign post.

#### Model Exam on Concept (2.4)

- 1 (A) 1. d 2. c 3. a 4. c  
(B) Because the kinetic energy of the bat transfers to the ball.
- 2 (A) 1. (✓) 2. (✗)  
3. (✓) 4. (✓)  
(B) The damage would be much more severe.
- 3 (A) 1. kinetic energy.  
2. height  
3. equal  
4. increases.  
(B) (1) Rise up the first ball, .....  
(2) Potential energy of the first ball .....  
(3) Kinetic energy is transferred from the first ball .....  
(4) Kinetic energy of all balls decreases .....
- 4 (A) 1. Wrecking ball.  
2. Collision.  
3. Vents.  
4. Sound energy.  
(B) The car causes less damage.

#### Model Exam on Theme (2)

- 1 (A) 1. c 2. b 3. d 4. c  
(B) 1. Due to the help of three jet engines.  
2. Because its stored energy changes into kinetic energy, that helps it moves downward.
- 2 (A) 1. (✗) 2. (✗)  
3. (✓) 4. (✗)  
(B) 1. The horse travels a distance longer than the runner in the same time.  
2. The energy of collision will push the driver forward strongly that causes many harms to him.
- 3 (A) 1. Pushing force.  
2. Kinetic energy.  
3. Claws. 4. Seatbelts.  
(B) 1. Radio (all items produce thermal energy, while radio produces sound energy).  
2. Light energy (all items are types of energy that cannot be seen, except light energy).
- 4 (A) 1. move. 2. decreases.  
3. energy  
4. mechanical – thermal  
(B) The speed of the train  
$$= \frac{\text{Distance}}{\text{Time}} = \frac{200}{2} = 100 \text{ km/hr.}$$

# Part 3

## Guide Answers of Final Examinations





## Model Exams

## Model Exam 1

- 1 (A) 1. b 2. c 3. d  
4. c 5. b

(B) To prevent the driver and passengers from moving forward when the car stops suddenly.

- 2 (A) 1. (✗) 2. (✓) 3. (✓)  
4. (✗) 5. (✗)

(B) The kinetic energy will increase.

- 3 (A) 1. decreases. 2. nose  
3. blurry 4. increase  
5. kinetic – sound

(B) Pulling force : 2 – 6  
Pushing force : 1 – 3 – 4 – 5

- 4 (A) 1. Trunk. 2. Nerves.  
3. Dots.  
4. Friction force.  
5. hour or second

(B) speed = distance ÷ time  
=  $300 \div 6 = 50$  m/sec

## Model Exam 2

- 1 (A) 1. shockwave truck – rocket  
2. kinetic  
3. electrical – sound  
4. eyes – brain.  
5. light – sound – ears.

(B) Due to the pushing force of his hand against the ball that stops it.

- 2 (A) 1. c 2. b 3. b  
4. c 5. d

(B) Light is reflected in different directions.

- 3 (A) 1. A gas oven 2. cars  
3. thermal energy.  
4. sharp  
5. tires

(B)

Opaque objects	Transparent objects
• Wood.	• Air. • Water.
• Metal.	• Lenses.

- 4 (A) 1. Nurse ants. 2. Gravity.  
3. Needle leaves.  
4. Claws.  
5. Nose.

(B) The speed of the truck  
= Distance ÷ Time  
=  $160 \div 2 = 80$  km/hr.

## Model Exam 3

- 1 (A) 1. c 2. d 3. b  
4. b 5. d

(B) Because the mirror has more smoothness than the painted surface.

- 2 (A) 1. (✗) 2. (✓) 3. (✓)  
4. (✓) 5. (✓)

(B) The small heart cannot make cheetah runs faster.

- 3 (A) 1. Sense organs.  
2. Vents or Holes.  
3. Rough surface.  
4. Satellite.  
5. Diaphragm.

(B)

Organisms live in deserts	Organisms live in forests
– Starred agama lizard.	– Panther chameleon.
– Fennec fox.	– Kapok tree.
– Palm tree.	
– Barbary fig plant.	

- 4 (A) 1. more  
2. trachea  
3. decrease – friction force  
4. sight  
5. fuel (gasoline) – chemical – kinetic

(B)

Points of comparison	Inhalation	Exhalation
1. Diaphragm movement :	Downward	Upward
2. Size of chest cavity :	Increases	Decreases
3. The air is rich in :	Oxygen gas	Carbon dioxide gas

## Model Exam 4

- 1 (A) 1. Camouflage.  
2. Nervous system.

3. Cutting down forests.  
4. Electrical energy.  
5. Work.

(B) The Sun (or candle .... etc.).

- 2 (A) 1. c 2. a 3. d  
4. b 5. d

(B) The ecosystem still clean without pollution.

- 3 (A) 1. unbalanced  
2. sound  
3. Kinetic energy  
4. nervous system.  
5. Smooth

(B) Yes, because cheetah is the fastest land animal in the world which is faster than the deer.

- 4 (A) 1. collects – reflects  
2. ears – brain  
3. more  
4. smell – movement  
5. decrease.

(B)

Points of comparison	Polar bear	Forest bear
1. Habitat :	Polar habitat.	Forest habitat.
2. Fur color :	White.	Black or brown.



## Model Exam 5

- 1 (A) 1. b      2. a      3. b  
4. d      5. d
- (B) It cannot reach to under ground water in dry season, and cannot survived.
- 2 (A) 1. (✓)    2. (✗)    3. (✓)  
4. (✗)    5. (✓)
- (B) 1. Unbalanced.  
2. Balanced.  
3. Unbalanced.
- 3 (A) 1. Fennec foxes.  
2. Gravity.  
3. Touch sense.  
4. Airbags.  
5. Mangrove tree.
- (B) To be away from hungry mouths of animals.
- 4 (A) 1. Changing  
2. pulling  
3. Airbags  
4. pulling force  
5. faster
- (B) 1. nervous  
2. (2) - (3) - (1)

## Model Exam 6

- 1 (A) 1. b      2. d      3. b  
4. a      5. c

(B) Because camouflage helps some animals hide from their predators or preys in different environments.

- 2 (A) 1. (✗)    2. (✓)    3. (✗)  
4. (✗)    5. (✓)

(B) - Animals have super sight sense : Tarsier - Fishing cat.

- Animals have super hearing sense : Bat - Dolphin.

- 3 (A) 1. Small intestine.  
2. Countershading.  
3. Water.  
4. Energy.  
5. Tongue.

(B) It will continue moving, where there is nothing to stop it.

- 4 (A) 1. potential energy.  
2. potential energy  
3. kinetic energy.  
4. kinetic energy  
5. Sun

(B) 1. Fig. (a)  
2. Fig. (b)  
3. diaphragm - increases  
4. carbon dioxide

## Model Exam 7

- 1 (A) 1. b      2. a      3. d  
4. d      5. d

(B) Some of kinetic energy is changed into thermal energy.

- 2 (A) 1. penguin - polar bear.  
2. electrical - light - sound.  
3. energy  
4. hearing - bats - dolphins.  
5. the Sun - candle - Moon - mirror

(B) 1. c → B  
2. a → D  
3. d → A  
4. b → C

- 3 (A) 1. (✓)    2. (✗)    3. (✓)  
4. (✗)    5. (✓)

(B)  $\text{Speed} = \frac{\text{Distance}}{\text{Time}} = \frac{250}{5}$   
= 50 meter/second.

- 4 (A) 1. Respiration process.  
2. Panther chameleon.  
3. Lung.  
4. Fuel.  
5. Mechanical energy.

(B) Because polluted air causes harm to the respiratory system.

## Model Exam 8

- 1 (A) 1. (✓)    2. (✓)    3. (✓)  
4. (✓)    5. (✗)

(B) Because the speed is the distance traveled in a certain amount of time.

- 2 (A) 1. b      2. b      3. c  
4. b      5. a

(B) The speed of the train

$$= \frac{\text{Distance}}{\text{Time}} = \frac{220}{2} = 110 \text{ km/hr.}$$

- 3 (A) 1. Engineers  
2. increases  
3. Water  
4. stronger  
5. different

(B) The nurse ants send smelly messages to scout ants to alert the ants where to find the food.

- 4 (A) 1. The Moon (All items are sources of light, while the Moon is reflecting the light).  
2. Fireflies (All items use echolocation property, while fireflies cannot use echolocation property).  
3. Bull shark (All items live on land, while bull shark lives in water).  
4. Flashlight (All items produce sound energy, while flashlight produces light energy).



5. Eyes (All items are senses, while eyes are sense organs).

- (B) 1. parachute.  
2. shockwave truck – rocket.

### Model Exam 9

- 1 (A) 1. wings – code  
2. (B) – (A)  
3. lungs  
4. airbags – seatbelts.  
5. blurry  
(B) Due to the difference in the forces that act on them.

- 2 (A) 1. (✗) 2. (✓) 3. (✓)  
4. (✓) 5. (✗)

(B) The speed of the runner  

$$= \frac{\text{Distance}}{\text{Time}} = \frac{400}{8} = 50 \text{ m/sec.}$$

- 3 (A) 1. The soldier ants.  
2. Penguin.  
3. Light.  
4. Nervous system.  
5. The spine (backbone).  
(B) They cannot communicate with each other or locating the objects by the sense of hearing.

- 4 (A) 1. d 2. d 3. a  
4. c 5. c

(B)

Types of communication	The used senses
1. Watching TV.	- Sight and hearing.
2. Flashing lights of fireflies.	- Sight.
3. Echolocation in dolphins.	- Hearing.
4. Using the cell phone.	- Sight and hearing.

### Model Exam 10

- 1 (A) 1. d 2. c 3. a  
4. d 5. c

(B) Because it transfers messages between the brain and body parts.

- 2 (A) 1. energy  
2. bat – dolphin  
3. kinetic 4. kinetic  
5. potential – kinetic

(B) The speed of the car  

$$= \frac{\text{Distance}}{\text{Time}} = \frac{100}{2} = 50 \text{ km/hr.}$$

- 3 (A) 1. e 2. d 3. a  
4. b 5. c

(B) It will fall down on the ground due to the pulling force of gravity.

- 4 (A) 1. (✓) 2. (✓) 3. (✗)  
4. (✗) 5. (✓)  
(B) 1. (1), (3) 2. (4)  
3. (2)